UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

APR 25 2011

Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act (NEPA), the National Oceanic and Atmospheric Administration (NOAA) intends to adopt the U.S. Navy's *Final Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities (FEIS)* to comply with NEPA and for agency decision-making purposes. NOAA's proposed action is to issue a 5-year rulemaking and associated Letters of Authorization (LOAs) to the Navy to take marine mammals incidental to its military readiness activities in the Gulf of Alaska Temporary Maritime Activities Area (GoA TMAA) and is related to the Navy's proposed action to conduct military readiness activities in the GoA TMAA. NOAA has determined that this FEIS adequately analyzes and discloses the environmental impacts associated with this project. Therefore, we enclose this FEIS your review.

This FEIS is prepared pursuant to NEPA to assess the environmental impacts associated with NOAA proceeding with issuing the rulemaking and LOA. NMFS' proposed action (issuance of regulations and LOAs) would authorize take of marine mammals incidental to a subset of the activities analyzed in the FEIS that are anticipated to result in the take of marine mammals, i.e., those activities that involve the use of underwater active acoustic sources or explosive detonations. Thus, these components of the Navy's proposed action are interrelated as they are the subject of NMFS' proposed MMPA regulatory action.

NOAA is not required to respond to comments received as a result of issuance of the FEIS. However, comments will be reviewed and considered for their impact on issuance of a record of decision (ROD). Please send comments to the responsible official identified below. The ROD will be made available publicly following final agency action on or after April 15th, 2011.

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Sincerely,

Paul N. Doremus, Ph.D.
NOAA NEPA Coordinator

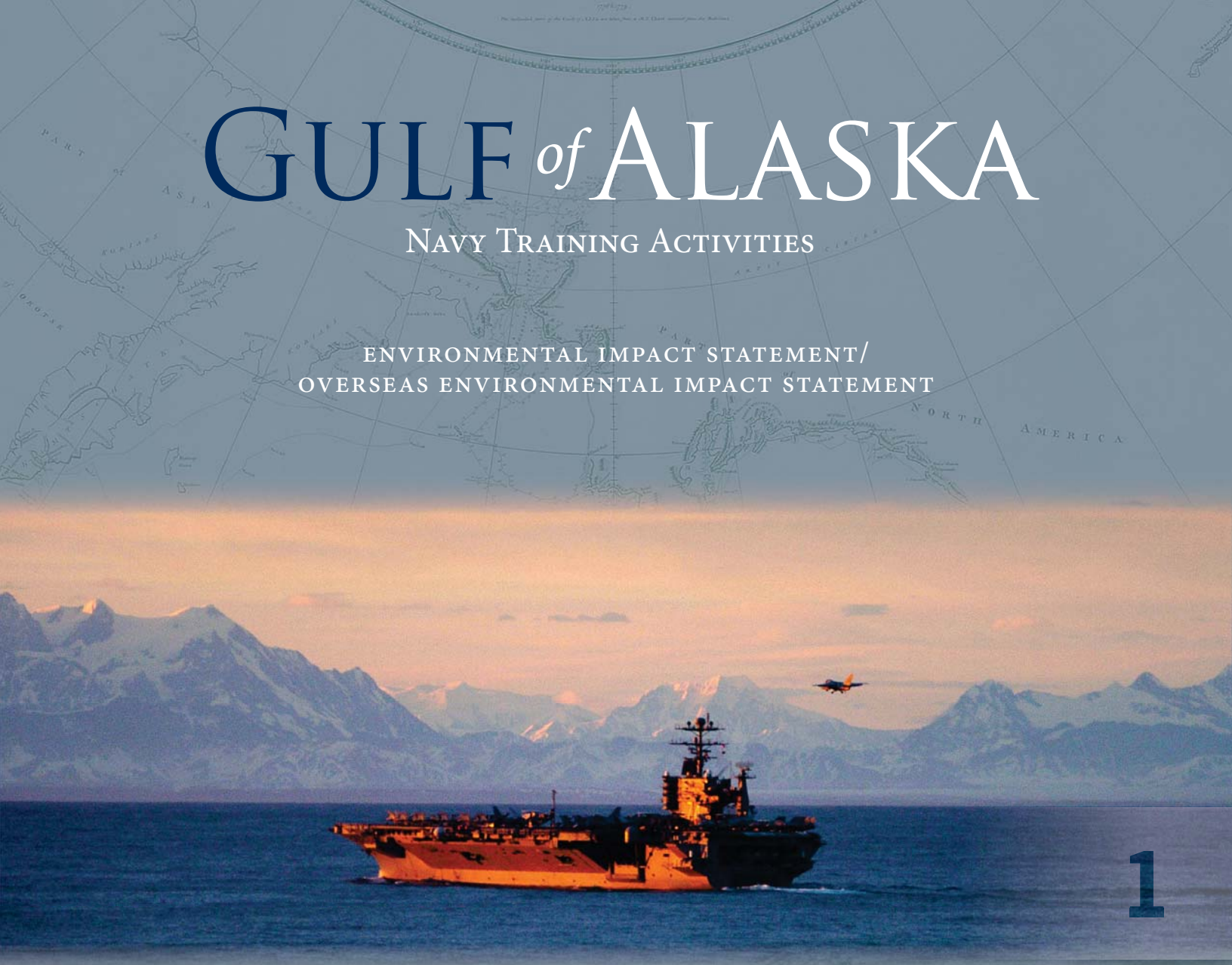
Enclosure

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GULF of ALASKA

Navy Training Activities

ENVIRONMENTAL IMPACT STATEMENT/
OVERSEAS ENVIRONMENTAL IMPACT STATEMENT



1

March 2011
Final EIS/OEIS
Volume One

Gulf of Alaska Navy Training Activities
Preliminary Final Environmental Impact Statement/ Overseas Environmental Impact Statement

Commander, U.S. Pacific Fleet
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Chapters 1-9
Volume 1

MARCH 2011

COVER SHEET
ENVIRONMENTAL IMPACT STATEMENT/
OVERSEAS ENVIRONMENTAL IMPACT STATEMENT
GULF OF ALASKA NAVY TRAINING ACTIVITIES

Lead Agency for the EIS: U.S. Department of the Navy

Title of the Proposed Action: Gulf of Alaska Navy Training Activities

Designation: Environmental Impact Statement/Overseas Environmental Impact Statement

Abstract

This Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) has been prepared by the United States (U.S.) Department of the Navy in compliance with the National Environmental Policy Act (NEPA) of 1969 (42 United States Code § 4321 et seq.); the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [C.F.R.] §§ 1500-1508); U.S. Department of the Navy Procedures for Implementing NEPA (32 C.F.R. § 775); and Executive Order 12114, *Environmental Effects Abroad of Major Federal Actions*. The Headquarters of the National Marine Fisheries Service is a cooperating agency on this EIS/OEIS. The Navy has identified the need to support and conduct current, emerging, and future training activities in the Gulf of Alaska. Three alternatives are analyzed in this EIS/OEIS. The No Action Alternative will continue training activities of the same types, and at the same levels of training intensity as currently conducted, without change in the nature or scope of military activities in the EIS/OEIS Study Area. Alternative 1, in addition to accommodating training activities addressed in the No Action Alternative, would support an increase in training activities, as well as the inclusion of Anti-Submarine Warfare activities to include the use of active sonar. Alternative 1 also proposes training required by force structure changes to be implemented for new weapons systems, instrumentation, and technology as well as new classes of ships, submarines, and new types of aircraft. In addition, specific training instrumentation enhancements would be implemented, to include development and use of the portable undersea tracking range. Alternative 2 would include all elements of Alternative 1. In addition, under Alternative 2, one additional joint force exercise would occur during the summer months (April through October), as well as up to two sinking exercises.

This EIS/OEIS addresses the potential environmental impacts that result or could result from activities under the No Action Alternative, Alternative 1, and Alternative 2. Environmental resource topics evaluated include air quality, expended materials, water resources, acoustic environment (airborne), marine plants and invertebrates, fish, sea turtles, marine mammals, birds, cultural resources, transportation and circulation, socioeconomics, environmental justice and protection of children, and public safety.

Prepared by: Department of the Navy

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Executive Summary

ES EXECUTIVE SUMMARY

ES 1.1 INTRODUCTION

This Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) analyzes the potential environmental effects that may result from the United States (U.S.) Navy's Proposed Action and Alternatives. The Proposed Action and Alternatives address ongoing naval training activities (one joint force exercise occurring over a maximum time period of 14 days during summer months [April through October]). The Proposed Action also consists of Navy training activities associated with conducting two large-scale joint force exercises, including Anti-Submarine Warfare (ASW) activities and the use of active sonar. These exercises would each last up to 21 days (focused exercise period) and consist of multiple component training activities as described in greater detail in Section 2.5. During these focused exercise periods, intermittent Navy Unit Level Training (ULT) could also occur. However, outside of these focused activity periods, during the other 46-49 weeks of the year, the Navy does not train within the Temporary Maritime Activities Area (TMAA) or other areas of the Gulf of Alaska (GOA).

Three alternatives are analyzed in this EIS/OEIS: the No Action Alternative – Current Training Activities within the Alaska Training Areas (ATAs), Alternative 1 – Increase Training Activities to Include Anti-Submarine Warfare Activities and Accommodate Force Structure Changes, and Alternative 2 (Preferred Alternative) – Increase Training Activities, Accommodate Force Structure Changes, Conduct One Additional Annual Joint Force Exercise, and Conduct One Sinking Exercise (SINKEX) During Each Summertime Exercise.

Under the No Action Alternative, training activities would continue at baseline levels. Under Alternative 1, naval training activities would increase; the joint force exercise would increase to last up to 21 days, ASW activities, to include the use of active sonar, would be conducted, and the use of a Portable Undersea Tracking Range (PUTR) would be implemented. Alternative 2 would be the same as Alternative 1; however, it would include conducting the joint force exercise two times during the summer months from April to October (each up to 21 days long) and a SINKEX during each summertime exercise (a maximum of two) in the GOA TMAA.

The geographic area covered by this EIS/OEIS consists of three components: 1) the GOA TMAA; 2) U.S. Air Force (Air Force) over-land Special Use Airspace (SUA) and air routes over the GOA and State of Alaska, and 3) U.S. Army (Army) training lands. Collectively, for the purposes of this EIS/OEIS, these areas are referred to as the ATAs (Figure ES-1). The Air Force SUA and Army training lands are analyzed for National Environmental Policy Act (NEPA) purposes under separate environmental documents. This EIS/OEIS does not involve the creation or development of new training areas on land or changes in the use of airspace over land or water. Nor does it include modifications to training areas at sea that the Navy has been using over the last ten years during exercises and training. Training activities analyzed in this EIS/OEIS include those conducted by the Navy and other U.S. Department of Defense (DoD) services supporting Navy training as discussed in the Description of Proposed Action and Alternatives (Chapter 2).

This Final EIS/OEIS has been prepared by the Department of the Navy in compliance with NEPA of 1969 (42 United States Code [U.S.C.] § 4321 et seq.); the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [C.F.R.] Parts [§§] 1500-1508); Department of the Navy Procedures for Implementing NEPA (32 C.F.R. § 775); and Executive Order (EO) 12114, *Environmental Effects Abroad of Major Federal Actions* (EO No. 12114, 44 Federal Register [FR] 1957 Jan 4, 1979). This Final EIS/OEIS satisfies the requirements of NEPA and Executive Order (EO) 12114, and will be filed with the U.S. Environmental Protection Agency (USEPA) and made available to appropriate federal, state, local, and other private and public entities.

The Navy is the lead agency for the EIS/OEIS and the headquarters of the National Marine Fisheries Service is a cooperating agency, pursuant to 40 C.F.R. §§ 1501.6 and 1508.5.

Since the 1990s, the Navy has participated in a major exercise in the GOA that involves the Departments of the Navy, Army, Air Force and U.S. Coast Guard (Coast Guard) participants reporting to a unified or joint commander who coordinates the activities planned to demonstrate and evaluate the ability of the services to engage in a conflict and carry out plans in response to a national security threat. Service Secretaries and Combatant Commanders report to the Secretary of Defense. Combatant Commanders are the senior military authority for their assigned area of responsibility. The U.S. Pacific Command (PACOM[1]), based in Hawaii, has the primary warfighting mission to defend the United States and its interests in the Asia-Pacific Region. The U.S. Northern Command (NORTHCOM) has the primary responsibility for homeland defense. Each of these combatant commanders is supported by component commanders comprising forces from the Navy, Army, and Air Force. The Combatant Commanders develop exercises that train the Navy, Army and Air Force components to execute plans for situations that they identify as necessary to defend U.S. interest.

The TMAA is composed of 42,146 square nautical miles (nm^2) (145,482 square kilometers [km^2]) of surface and subsurface ocean training area and overlying airspace that includes the majority of Warning Area 612 (W-612). W-612 consists of about 2,256 nm^2 (8,766 km^2) of airspace. No Navy training activities analyzed in this document will occur in the area of W-612 that is outside of the TMAA (Figure ES-1). The TMAA is approximately 300 nautical miles (nm) (555.6 kilometers [km]) in length by 150 nm (277.8 km) in width and situated south of Prince William Sound and east of Kodiak Island. The TMAA's northern boundary is located approximately 24 nm (44 km) south of the shoreline of the Kenai Peninsula, which is the largest proximate landmass. The only other shoreline close to the TMAA is Montague Island, which is located 12 nm (24 km) north of the TMAA. The approximate middle of the TMAA is located 140 nm (259 km) offshore. The inland Air Force SUA consists of 46,585 nm^2 (159,782 km^2) of airspace and the Army training land consists of 1,981 nm^2 (6,796 km^2) of land area.

All maritime training activities analyzed in this document take place within the TMAA (Figure ES-2) and the exercises normally occur during the period between April and October. For Navy training activities that do occur in the inland Alaska ranges of the Air Force and Army, impacts associated with those activities have previously been analyzed and addressed in separate environmental analyses conducted by the Air Force and the Army (see Chapter 1, Section 1.6). As such, those activities are identified but not carried forward for analysis within the EIS/OEIS.

The Navy's mission is to organize, train, equip, and maintain combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This mission is mandated by federal law (Title 10 U.S.C. § 5062), which ensures the readiness of the United States' naval forces.[2] The Navy executes this responsibility by establishing and executing training programs, including at-sea training and exercises, including ASW activities (to include the use of active sonar), and ensuring naval forces have access to the ranges, operating areas, and airspace needed to develop and maintain skills for conducting naval activities.

[1] PACOM is a unified command which includes about 325,000 military personnel from the Army, Navy, Air Force, and Marine Corps (about 20 percent of all active duty U.S. military forces).

[2] Title 10, Section 5062 of the United States Code provides: "The Navy shall be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea. It is responsible for the preparation of Naval forces necessary for the effective prosecution of war except as otherwise assigned and, in accordance with Integrated Joint Mobilization Plans, for the expansion of the peacetime components of the Navy to meet the needs of war."

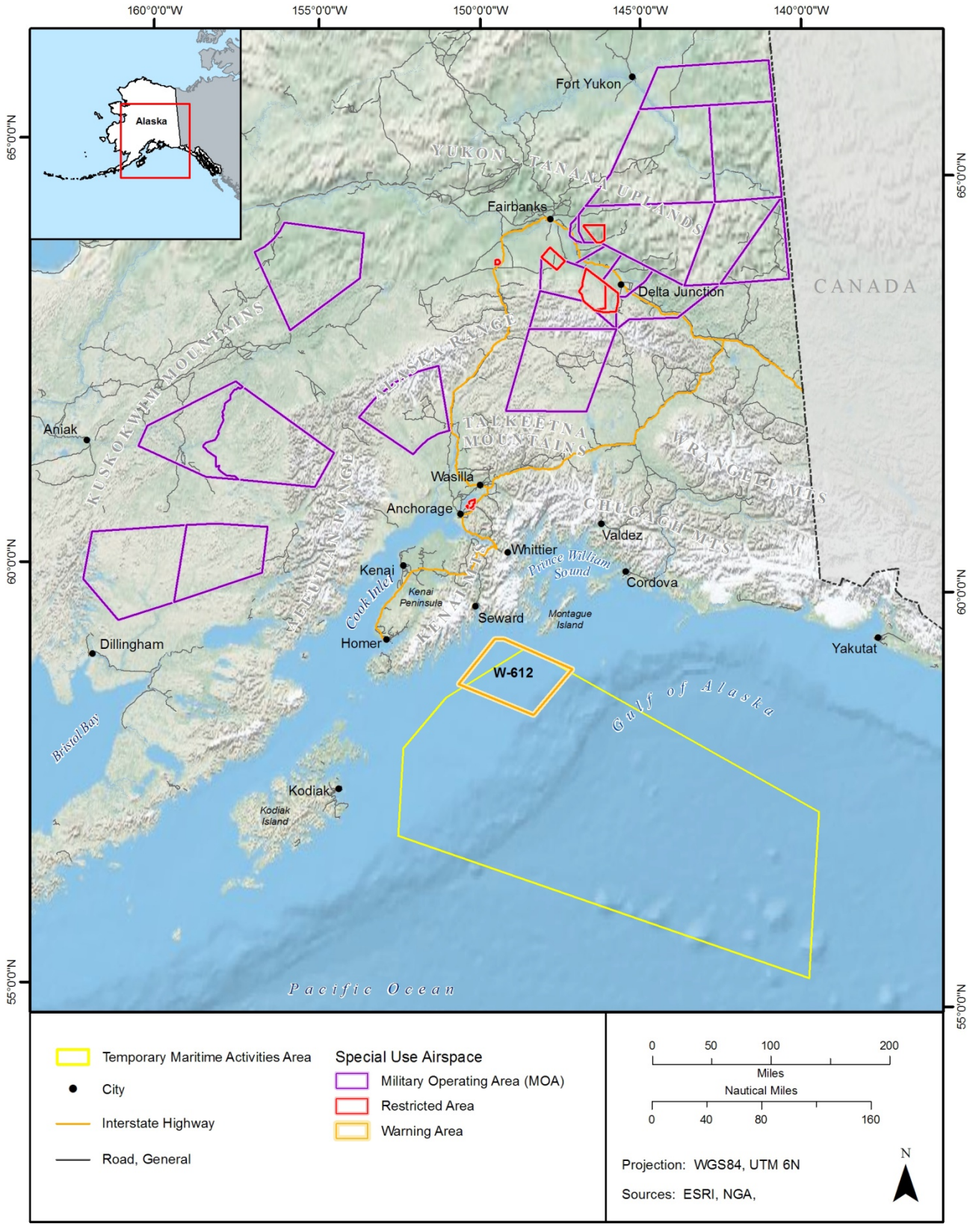


Figure ES-1: Alaska Training Areas

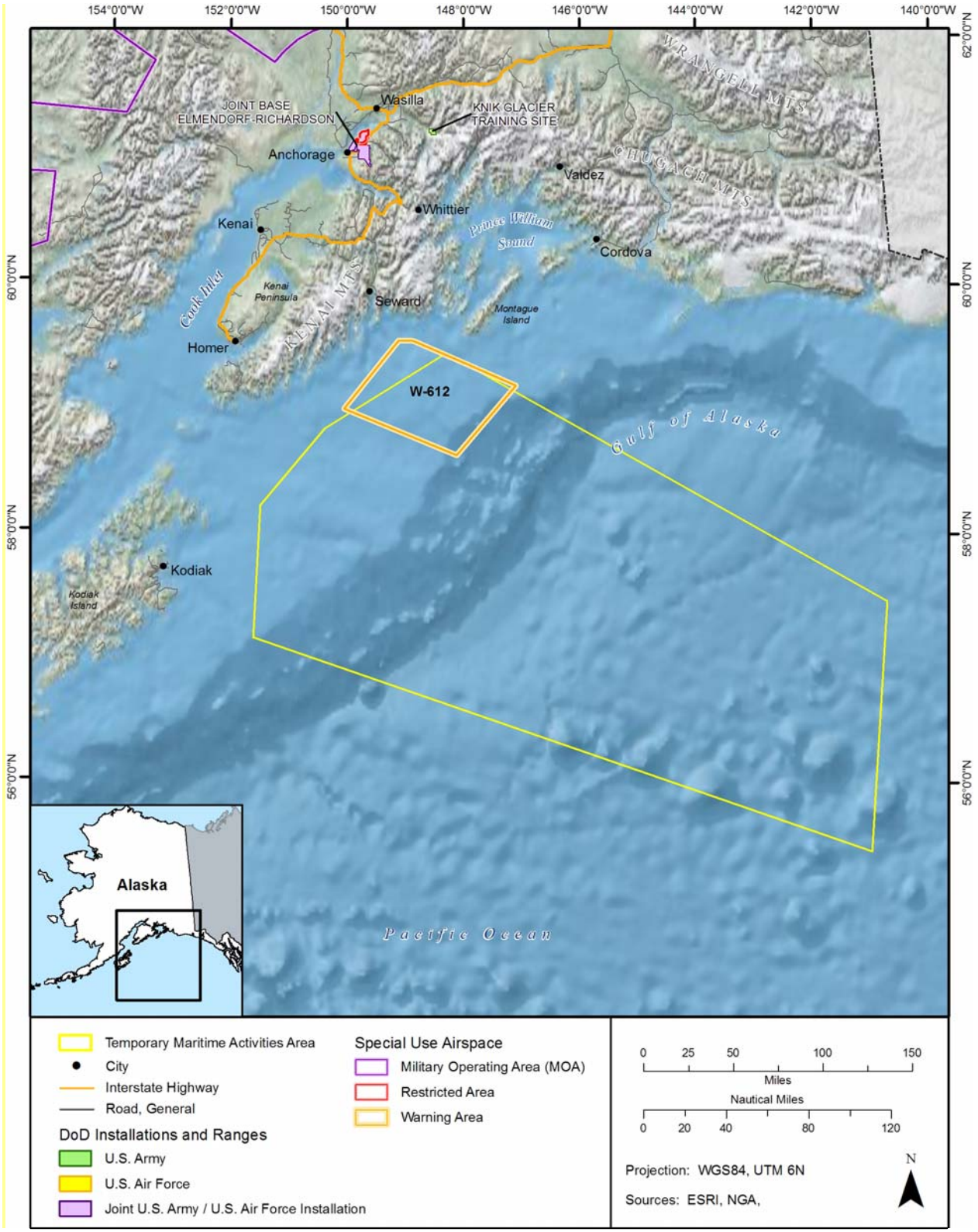


Figure ES-2: Gulf of Alaska Temporary Maritime Activities Area

The ATA plays a vital part in executing this naval readiness mandate. The training areas serve as the principal training venue for annual joint training exercises, which can involve forces from the Navy, Air Force, Army, and Coast Guard. The Navy's Proposed Action is a step toward ensuring the continued vitality of this essential naval training resource.

ES 1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

Given the vital importance of the ATA to the readiness of naval forces and the unique training environment provided by the ATA, the Navy proposes to take actions for the purpose of:

- Supporting U.S. PACOM training requirements;
- Supporting Joint Task Force Commander training requirements;
- Achieving and maintaining Fleet readiness using the ATA to support and conduct current, emerging, and future training activities; and
- Expanding warfare missions supported by the training conducted in the ATA, consistent with requirements.

The Proposed Action is needed to continue to provide a training environment with the capacity and capabilities to fully support required training tasks for operational units participating in Joint exercises, such as the annual Northern Edge exercise. The Navy has developed alternatives criteria based on this statement of the purpose of and need for the Proposed Action.

In this regard, the ATA furthers the Navy's execution of its roles and responsibilities under Title 10. To comply with its Title 10 mandate, the Navy needs to:

- Maintain current levels of military readiness by training in the ATA;
- Accommodate future increases in training activity tempo in the ATA;
- Support the acquisition and implementation into the Fleet of advanced military technology using the ATA to conduct training activities for new platforms and associated weapons systems (EA-18G Growler aircraft, Guided Missile Submarines [SSGN], P-8 Poseidon Multimission Maritime Aircraft [MMA], Guided Missile Destroyer [DDG] 1000 [Zumwalt Class] destroyer, and several types of Unmanned Aerial Systems [UASs]);
- Identify shortfalls in training, particularly training instrumentation, and address through enhancements;
- Maintain the long-term viability of the ATA as a Navy training area while protecting human health and the environment, and enhancing the quality, capabilities, and safety of the training area; and
- Be able to bring Army, Navy, Air Force, and Coast Guard assets together into one geographic area for joint training.

ES 1.3 SCOPE AND CONTENT OF THE EIS/OEIS

Navy training activities that occur within the Air Force inland SUA and the Army training lands are analyzed under previous NEPA documentation (the *Alaska Military Operations Area EIS* [USAF 1995], *Improvements to Military Training Routes in Alaska Environmental Assessment* [USAF 2007], the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* [Army 1999], and the *Transformation of U.S. Army Alaska FEIS* [Army 2004]). These documents are incorporated by reference pursuant to 40 C.F.R. §

1502.21, which, in NEPA terms, means that the environmental effects of these activities are addressed in these documents.

Environmental effects in the open ocean beyond the U.S. territorial sea (outside of 12 nm) are analyzed in this EIS/OEIS pursuant to EO 12114 and associated implementing regulations.

This EIS/OEIS provides an assessment of environmental effects associated with current and proposed training activities and changes in force structure (to include new systems, platforms, and instrumentation).

ES 1.3.1 National Environmental Policy Act

The first step in the NEPA process is the preparation of a Notice of Intent (NOI) to develop an EIS/OEIS. The NOI provides an overview of the Proposed Action, Alternatives, and the scope of the EIS/OEIS. The NOI for this project was published in the *Federal Register* on March 17, 2008, and in four local newspapers, (*Anchorage Daily News, Kodiak Daily Mirror, Cordova Times, Peninsula Clarion* [see Appendix G]). The NOI and newspaper notices included information about comment procedures, a list of information repositories (public libraries), the project website (http://www.GulfofAlaskaNavyEIS.com), and the dates and locations of the scoping meetings.

Scoping is the early and open public process for determining the "scope" of issues to be addressed in the Draft EIS/OEIS, and for identifying significant issues related to a Proposed Action. In April of 2008, the three scoping meetings for the Draft EIS/OEIS (held in Kodiak, Alaska [AK]; Anchorage, AK; and Cordova, AK) invited public attendance to help define and prioritize environmental issues, and convey these issues to the Navy. As a result of the scoping process, the Navy received comments from the public (see Appendix G), as well as agencies, private entities, and federally recognized Alaska Native Tribes and Nations which were considered in the preparation of the Draft EIS/OEIS.

Incorporating public input from the scoping process, the Draft EIS/OEIS was prepared to assess the potential effects of the Proposed Action and Alternatives on the environment. A Notice of Availability was published in the *Federal Register* on 11 Dec, 2009, and notices were placed in five local newspapers (*Anchorage Daily News, Kodiak Daily Mirror, Cordova Times, Peninsula Clarion, Juneau Empire* [see Appendix G]) announcing the availability of the Draft EIS/OEIS. The Draft EIS/OEIS was made available for public and agency review and was circulated for review and comment. Public meetings were held in the same geographic venues as the scoping meetings; however, in response to public input, two additional venues were added in Homer and Juneau, Alaska to receive public comments on the Draft EIS/OEIS. Public comments received on the Draft EIS/OEIS are responded to in Appendix I of this Final EIS/OEIS. Appendix I contains a copy of all written and oral comments and formal transcripts of the public hearings, including the comments received during the hearings.

This Final EIS/OEIS was prepared in response to all public comments, including comments received from other federal and state agencies, on the Draft EIS/OEIS. Responses to public comments may take various forms as necessary, including correction of data, clarifications of and modifications to analytical approaches, and inclusion of additional data or analyses.

Finally, after the Final EIS/OEIS is made available to the public and a 30-day review period has elapsed, a Record of Decision (ROD) will be issued, pursuant to 40 C.F.R. § 1502.2. The ROD will summarize the Navy's decision, identify the selected alternative, describe the public involvement and agency decision-making processes, and present commitments to specific mitigation measures.

ES 1.3.2 Executive Order (EO) 12114

EO 12114, *Environmental Effects Abroad of Major Federal Actions*, directs federal agencies to provide for informed decision making for major federal actions outside the U.S. territorial sea (> 12 nm [22.2km]

from shore). This includes actions within the Exclusive Economic Zone (EEZ) of the U.S. or a foreign nation, or the high seas, but excludes the territorial sea of a foreign nation. The EEZ comprises areas beyond 12 nm (22.2 km) out to 200 nm (370.4 km) from shore. This Final EIS/OEIS satisfies the requirements of EO 12114 for analysis of training activities or impacts occurring, or proposed to occur, beyond the U.S. territorial sea and within the U.S. EEZ, and on the high seas (see Table 1-1, Section 1.5).

ES 1.3.3 Coastal Zone Management Act

The *Coastal Zone Management Act* (CZMA) of 1972 (16 U.S.C. § 1451) encourages coastal states to be proactive in managing coastal uses and coastal resources in the coastal zone. The CZMA established a voluntary coastal planning program through which participating states submit a Coastal Management Plan (CMP) to the National Oceanographic and Atmospheric Administration (NOAA) Office of Ocean and Coastal Resource Management (OCRM) for approval. Under CZMA, federal actions are required to be consistent, to the maximum extent practicable, with the enforceable policies of approved state CMPs. The CZMA federal consistency determination process includes a review of the proposed federal actions by the states to determine whether the federal action, in or outside the coastal zone, that affects any land or water use or natural resources of a State's coastal zone, directly or indirectly, is consistent with the enforceable policies of the state's CMP.

The State of Alaska has an approved CMP (Alaska Coastal Management Plan -"ACMP"), which was established under the Coastal Management Act of 1977, and is found at Alaska Statutes Annotated (AS) 46.40 et seq. The ACMP received federal approval from the NOAA in 1979 and Alaska has adopted, and OCRM has approved, additional changes to the ACMP. The Alaska Department of Natural Resources (ADNR) is the state's designated coastal management agency and is responsible for reviewing projects for consistency with the ACMP and issuing coastal management decisions under the provisions of 11 AAC Code Chapter 110. Specific statewide standards for review under the ACMP are found at 11 AAC Chapter 112.

In general, the CZMA defines the coastal zone as extending "to the outer limit of State title and ownership under the Submerged Lands Act." (16 USC § 1453). For the state of Alaska, CZMA coastal boundaries are determined by each individual Coastal Resource District pursuant to 11 Alaska Administrative Code (AAC) 114.220.

Specific standards under the ACMP that are applicable to proposed training activities occurring in the TMAA are 11 AAC Chapter 112 Sections 300 ("Habitats") and 310 ("Air, Land, and Water Quality).

For the activities covered in this Final EIS/OEIS, the Navy has ensured compliance with the CZMA through coordination with the ADNR and the submission of a *de minimis* determination under 15 C.F.R. § 930.33(a)(3)(i) on 29 July 2010. This was based on the Navy's determination that the activities analyzed under this EIS were expected to have only insignificant direct or indirect (secondary and cumulative) coastal effects. ADNR concurred with the *de minimis* determination on 14 October 2010.

ES 1.3.4 Other Environmental Requirements Considered

The Navy must comply with a variety of other federal environmental laws, regulations, and EOs. These include (among other applicable laws and regulations):

- Marine Mammal Protection Act (MMPA) (16 U.S.C. §§ 1361-1407);
- Endangered Species Act (ESA) (16 U.S.C. §§ 1531-1544);
- Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703-711);

- Rivers and Harbors Act (RHA) (33 U.S.C. §§ 401-426);
- Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) for Essential Fish Habitat (EFH) (16 U.S.C. §§ 1801-1891);
- Clean Air Act (CAA) (42 U.S.C. §§ 7401-7671);
- Federal Water Pollution Control Act (Clean Water Act) (33 U.S.C. §§ 1251-1387);
- National Historic Preservation Act (NHPA) (16 U.S.C. § 470);
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898, 59 FR 7269 [Feb 16, 1994]);
- EO 13045, Environmental Health and Safety Risks to Children (EO 13045, 62 FR 19885 [Apr 23, 1997]);
- Alaska Native Claims Settlement Act of 1971 (ANSCA) (43 U.S.C. §§ 1601-1629); and
- Alaska National Interest Lands Conservation Act (ANILCA) (16 U.S.C. §§ 3101-3233).

In addition, laws and regulations of the State of Alaska appropriate to Navy actions are identified and addressed in this Final EIS/OEIS. This Final EIS/OEIS will facilitate compliance with applicable state laws and regulations.

ES 1.4 PROPOSED ACTION AND ALTERNATIVES

ES 1.4.1 Alternatives Development

NEPA implementing regulations provide guidance on the consideration of alternatives in an EIS/OEIS. These regulations require the decision maker to consider the environmental effects of the Proposed Action and a range of alternatives to the Proposed Action (40 C.F.R. § 1502.14). The range of alternatives includes reasonable alternatives, which must be rigorously and objectively explored, as well as other alternatives that are eliminated from further consideration and from further detailed study. To be "reasonable," an alternative must meet the stated purpose of and need for the Proposed Action.

For purposes of this EIS/OEIS, the No Action Alternative serves as the baseline level of operations, representing the regular and historical level of training activity necessary to maintain Navy readiness. Consequently, the No Action Alternative stands as no change from current levels of training usage. This interpretation of the No Action Alternative is consistent with guidance provided by Council on Environmental Quality (CEQ) (CEQ's 40 Most Asked Questions, Question #3; http://ceq.hss.doe.gov), which indicates that where ongoing federal programs continue, even as new plans are developed, "no action" is "no change" from current management direction or level of management intensity. The potential impacts of the current level of training within the ATA (defined by the No Action Alternative) are compared to the potential impacts of activities proposed under Alternative 1 and Alternative 2.

The purpose of including a No Action Alternative in environmental impact analyses is to ensure that agencies compare the potential impacts of the proposed major federal action to the known impacts of maintaining the status quo.

Alternatives considered in this EIS/OEIS were developed by the Navy after careful assessment by subject-matter experts, including military units and commands that use the ATA, range management professionals, and Navy environmental managers and scientists. The Navy has developed a set of criteria to use in assessing whether a possible alternative meets the purpose of and need for the Proposed Action. Each of these criteria assumes implementation of mitigation measures for the protection of natural

resources, as appropriate. Any alternative considered for future analysis should support or employ the following criteria:

1. Appropriate physical environment – unique and complex bathymetric/oceanographic conditions. The following attributes combine to provide a challenging environment for Navy forces to conduct ASW training:

    - Existence of a continental shelf, submarine canyons, and seamounts in the area;
    - Fresh water inputs into the GOA from multiple sources; and
    - Unique areas of upwelling and currents.

2. Proximity of Alaska land and sea training areas to each other to accommodate the joint training mission. The location of the TMAA is directly related to the location of permanent land and air training ranges in the State of Alaska, and supports the mission requirement of Alaskan Command (ALCOM)[3] to conduct joint training for Alaska-based forces and the following elements:

    - Ability to support ALCOM simulated combat conditions and activities;
    - Infrastructure that supports a robust opposition force, which allows realistic training;
    - Land-based infrastructure to support safety of naval aviation including air fields for aircraft emergency diverted landings; and
    - Facilitation of Joint Task Force training in support of PACOM.

3. Availability of sufficiently sized air space and ranges that support tactically realistic joint training activities. This criterion allows for:

    - Fewer restrictions on supersonic flights;
    - Ability to conduct numerous types of training activities at the same time in relative proximity without compromising safety and training objectives;
    - Continuous, nonsegmented training, from launch to recovery; and
    - Support of the full spectrum of joint, allied, and coalition training.

4. Appropriate weather conditions for a cold-water environment suitable for maritime activities at sea, including a sea state of three or less on the Beaufort scale (defined as a moderate sea; average wave height of 2-4 feet [ft] [0.6-1.2 meters {m}]).

5. Minimal encroachments on joint training requirements that could include, but are not limited to:

    - Low interference in the electronic spectrum to allow for unrestricted use of electronic sensors and systems; and
    - Large areas with sparse populations or low to no permanent human populations.

6. Training sustainment in support of the DoD Title 10 mandate.

[3] The mission requirement of ALCOM is to integrate military activities within Alaska to maximize the readiness of theater forces, expedite deployment of forces from and through Alaska in support of worldwide contingencies, and serve as the Joint Task Force (JTF) headquarters for protection of critical infrastructure and coordination of Military Assistance to Civil Authorities (MACA).

7. Proximity to shipping lanes for realistic training on avoiding conflicts with air and marine traffic.

Having identified criteria for generating alternatives for consideration in this Final EIS/OEIS, the Navy eliminated several alternatives from further consideration after initial review. Specifically, the following potential alternatives were not carried forward for analysis:

- Alternative Locations
- Reduced Training
- Alternate Time Frame
- Simulated Training

After careful consideration of each of these potential alternatives in light of the identified criteria, the Navy determined that none of them meets the Navy's purpose of and need for the Proposed Action. For a more detailed discussion of identified criteria and alternatives selected pursuant to the guidance of 40 C.F.R. § 1502.14(a), see Chapter 2 (Section 2.3.1); for alternatives considered but eliminated, see Chapter 2 (Section 2.3.2).

ES 1.4.2 Alternatives Considered

Three alternatives are analyzed in this EIS/OEIS and are described in detail below: 1) The No Action Alternative – continue current activities (involving no active sonar); 2) Alternative 1 – increase training activities to include the use of active sonar and accommodate force structure changes to include new platforms, weapon systems, and training enhancement instrumentation; 3) Alternative 2 – all portions of Alternative 1, conduct one additional Carrier Strike Group (CSG) exercise during summer months (April through October), annually, and conduct one Sinking Exercise (SINKEX) during each summer exercise, for a maximum of two annually.

The following sections contain the detailed discussion of Alternatives carried forward for analysis in the EIS/OEIS.

ES 1.4.3 No Action Alternative – Current Training Activities within the Alaska Training Areas

The Navy routinely conducts annual training in the ATA for national defense purposes. Under the No Action Alternative, training activities (no active sonar) as part of large-scale joint exercises would continue at baseline levels required to execute the joint training exercise requirements (one joint force exercise occurring over a maximum time period of up to 14 consecutive days during the summer months [April through October]). The Navy would not increase training activities above historical levels, but would continue exercises in the ATA, and specifically the TMAA, with up to one CSG or equivalent forces. Evaluation of the No Action Alternative in this EIS/OEIS provides a baseline for assessing environmental impacts of Alternative 1 and Alternative 2 (Preferred Alternative), as described in the following subsections.

Training activities and exercises currently conducted in the ATA are briefly described below. Each military training activity described in this EIS/OEIS meets a requirement that can be traced ultimately to requirements from the National Command Authority.[4] Training activities in the ATA stem from large-

[4] National Command Authority (NCA) is a term used by the United States military and government to refer to the ultimate lawful source of military orders. The term refers collectively to the President of the United States (as commander-in-chief) and the United States Secretary of Defense.

scale joint exercises, such as Northern Edge, which may involve thousands of participants. These exercises include basic individual or unit level training events of relatively short duration involving few participants that occur simultaneously with the large-scale joint exercises.

Over the years, the tempo and types of activities have fluctuated within the ATA due to changing requirements, the introduction of new technologies, the dynamic nature of international events, advances in warfighting doctrine and procedures, and force structure changes. Such developments have influenced the frequency, duration, intensity, and location of required training. The factors influencing tempo and types of activities are fluid in nature and will continue to cause fluctuations in training activities within the ATA. However, even with the fluidity of the training requirements, the "ceiling numbers" for the alternatives in the EIS/OEIS will not be exceeded. Accordingly, training activity data used throughout this EIS/OEIS are a representative baseline for evaluating impacts that may result from the proposed training activities.

For purposes of analysis, training activity data used in this EIS/OEIS are organized by Navy Primary Mission Areas (PMARs). The Navy currently trains in five PMARs in the TMAA: Anti-Air Warfare, Anti-Surface Warfare, Electronic Combat (EC), Naval Special Warfare (NSW), and Strike Warfare (STW). The Navy also conducts STW, EC, and NSW training in the Air Force SUA and Army training lands of the ATA. Although discussed in this document, these inland activities and their impacts are covered under other NEPA documentation by the Air Force and Army (USAF 1995, USAF 2007, Army 1999, and Army 2004 [refer to Sections 2.1.2 and 2.1.3]). Summary descriptions of current training activities are outlined in Table 2-7 (Section 2.6.3). As stated earlier, the No Action Alternative is the baseline of current training area usage, thus allowing a comparative analysis between the current tempo and proposed new uses and accelerated tempo of use.

ES 1.4.4 Alternative 1 – Increase Training Activities to Include Anti-Submarine Warfare Activities and Accommodate Force Structure Changes

Under Alternative 1, in addition to training activities currently conducted, the ATA would support an increase in training activities designed to meet Navy and DoD current and near-term operational requirements. This increase would encompass conducting one large-scale joint force exercise, including ASW activities and the use of active sonar, occurring over a maximum time period of up to 21 consecutive days during the summer months (April through October). Alternative 1 would include basic individual or unit level training events of relatively short duration occurring simultaneously with the large-scale joint force exercise. Alternative 1 would also accommodate increases in training activities due to force structure changes associated with the introduction of new weapon systems, vessels, aircraft, and training instrumentation into the Fleet. Training activities associated with force structure changes would be implemented for the EA-18G Growler, SSGN, P-8 MMA, DDG 1000 (Zumwalt Class), and UASs. Force structure changes associated with new weapons systems would include new types of sonobuoys. Force structure changes associated with new training instrumentation include the use of a Portable Undersea Tracking Range (PUTR). The PUTR would require the temporary placement of seven electronics packages on the seafloor, each approximately 3 ft (0.9 m) long by 2 ft (0.6 m) in diameter. No specific locations have yet been identified, but the electronic packages would be placed in water depths greater than 600 ft (182 m) and at least 3 nm (5.5 km) from land. Depending upon the configuration of the PUTR, it could cover an area from 25-100 nm^2. This is a temporary installation (to be recovered once training is complete), so no formal restricted areas would be designated and no limitations would be placed on commercial or civilian use of the area.

ES 1.4.5 Alternative 2 (Preferred Alternative) – Increase Training Activities, Accommodate Force Structure Changes, Conduct One Additional Annual Exercise, and Conduct One SINKEX During Each Summertime Exercise

Under Alternative 2, in addition to training activities included as a part of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes) the ATA would support an additional increase in training activities designed to meet Navy and DoD current and near-term operational requirements. This increase would entail the following activities:

- Conduct one additional separate large-scale joint force exercise, occurring over a maximum time period of up to 21 consecutive days during the summer months (April through October). Alternative 2 would include basic individual or unit level training events of relatively short duration occurring simultaneously with the large-scale joint force exercise.
- Conduct a SINKEX during each summertime exercise (a maximum of two annually) within the TMAA. During a SINKEX, a decommissioned surface ship is towed to a deep-water location and sunk using a variety of ordnance. The SINKEX would occur, by rule, at least 50 nm (93 km) offshore.

Alternative 2 is the Preferred Alternative because it would allow the greatest flexibility for Navy exercise planners to benefit from the unique joint training environment in the ATA. Additionally, Alternative 2 fully meets the criteria identified in Section 2.3.1.

ES 1.5 SUMMARY OF EFFECTS ANALYSIS

Chapter 3 of the EIS/OEIS describes existing environmental conditions for resources potentially affected by the Proposed Action and Alternatives described in Chapter 2. This chapter also identifies and assesses the environmental consequences of the Proposed Action and Alternatives. The affected environment and environmental consequences are described and analyzed according to categories of resources. The categories of resources addressed in this EIS/OEIS and the location of the respective analyses are identified in Table ES-1.

In the environmental impact analysis process, the resources analyzed are identified and the expected geographic scope of potential impacts for each resource, known as the resource's region of influence (ROI), is defined. The discussion and analysis, organized by resource area, covers the TMAA, to the extent affected resources or potential impacts are present.

Analysis of potential impacts of Navy activities on marine mammals is particularly complex. Therefore, the Navy has provided a comprehensive discussion of the approach to and results of the impacts analysis relating to marine mammals in Section 3.8 Marine Mammals and Appendix D Marine Mammal Modeling.

Table ES-1: Categories of Resources Addressed and EIS/OEIS Chapter

Air Quality (3.1)	Marine Mammals (3.8)
Expended Materials (3.2)	Birds (3.9)
Water Resources (3.3)	Cultural Resources (3.10)
Acoustic Environment (Airborne) (3.4)	Transportation and Circulation (3.11)
Marine Plants and Invertebrates (3.5)	Socioeconomics (3.12)
Fish (3.6)	Environmental Justice and Protection of Children (3.13)
Sea Turtles (3.7)	Public Safety (3.14)

ES 1.6 CUMULATIVE IMPACTS

The analysis of cumulative impacts considers the effects of the Proposed Action in combination with other past, present, and reasonably foreseeable future actions taking place in the project area, regardless of what agency or person undertakes these actions. This EIS/OEIS analyzes cumulative impacts associated with implementation of Navy-sponsored activities and other non-Navy activities in the region. Other activities analyzed include fishing, commercial and recreational marine traffic, ocean pollution, scientific research, and commercial and general aviation. Cumulative effects resulting from other relevant projects (such as those listed in Section 4.1.2) combined with the Proposed Action addressed in this EIS/OEIS were determined to have cumulative impacts, but those impacts are less than significant.

ES 1.7 MITIGATION AND PROTECTIVE MEASURES

NEPA regulations require an EIS to include appropriate mitigation measures not already included in the Proposed Action or Alternatives (40 C.F.R. § 1502.12(f)). Each of the Alternatives, including the Proposed Action considered in this EIS/OEIS, already includes protective or mitigation measures intended to reduce environmental effects from Navy activities. Measures, such as best management practices (BMPs) and Standard Operating Procedures (SOPs), are discussed in the resource-by-resource analysis, and also are addressed in detail in Chapter 5, Mitigation and Protective Measures.

As part of its commitment to sustainable use of resources and environmental stewardship, the Navy incorporates measures that are protective of the environment into all of its activities. These include employment of BMPs, SOPs, adoption of conservation recommendations, and other protective measures that mitigate the impacts of Navy activities on the environment. Some of these measures are generally designed to apply to certain geographic areas during certain times of year or for specific types of Navy training. Conservation measures covering habitats and species occurring in the ATA have been developed through various environmental analyses conducted by the Navy for land and sea ranges and adjacent coastal waters. The discussion in Chapter 5 describes mitigation measures applicable to Navy activities in the TMAA. Existing protective measures and mitigation measures are also presented in Table ES-2 for each resource section analyzed.

Table ES-2: Summary of Effects

		No Action Alternative	Alternative 1	Alternative 2
3.1 Air Quality	**NEPA (U.S. Territorial Seas, 0 to 12 nm)**	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to air quality would occur. • Overflights of ocean (0-12 nm) and land areas at altitudes above 3,000 ft AGL would not affect ground-level air quality.	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to air quality would occur. • Overflights of ocean (0-12 nm) and land areas at altitudes above 3,000 ft AGL would not affect ground-level air quality.	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to air quality would occur. • Overflights of ocean (0-12 nm) and land areas at altitudes above 3,000 ft AGL would not affect ground-level air quality.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• The No Action Alternative would maintain training activities and associated air pollutant emissions at baseline levels outside of U.S. territory.	• Outside of U.S. territory, air pollutant emissions would increase slightly, mainly from increased surface vessel and aircraft activities. • Although Alternative 1 would increase emissions of air pollutants over the No Action Alternative, emissions outside of U.S. territorial seas would not cause an air quality standard to be exceeded.	• Outside of U.S. territory, air pollutant emissions would increase mainly from increased surface vessel and aircraft activities. • SINKEX would generate a substantial portion of the air pollutants that would be emitted under Alternative 2. • Although Alternative 2 would increase emissions of air pollutants over the No Action Alternative, emissions outside of U.S. territorial seas would not cause an air quality standard to be exceeded.
	MITIGATION MEASURES: Equipment used by military organizations within the GOA, including ships and other marine vessels, aircraft, and other equipment, are properly maintained in accordance with applicable Navy and Marine Corps requirements. Operating equipment meets federal and state emission standards, where applicable. Annual emissions of criteria and hazardous air pollutants produced by the Proposed Action are well below a level that could degrade regional air quality. Therefore, no mitigation measures are required to reduce the impacts on the environment of air emissions from the Proposed Action.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.2 Expended Materials	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). No significant impacts related to expended materials will occur. • Aircraft overflights will not involve expenditures of training materials.	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). No significant impacts related to expended materials would occur. • Aircraft overflights would not involve expenditures of training materials.	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). No significant impacts related to expended materials would occur. • Aircraft overflights would not involve expenditures of training materials.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• Approximately 76,200 lb (34,600 kg) of training materials will be expended per year, with a density of 9.0 lb per nm^2 (1.2 kg per km^2) per year distributed over 20 percent of the TMAA. Over 97 percent of the expended items will be naval gun shells or small arms rounds. • Approximately 1,870 lb (850 kg) of hazardous materials would be distributed at an estimated 0.22 lb per nm^2 (0.03 kg per km^2) per year. • Expended materials under the No Action Alternative will not have a substantial effect on the environment.	• Increase in training would deposit approximately 143,000 lb (65,000 kg) of expended materials, with a density of 16.9 lb per nm^2 (2.23 kg per km2) per year distributed over 20 percent of the TMAA. Over 93 percent of the expended items would be naval gun shells or small arms rounds. • Approximately 4,890 lb (2,220 kg) of hazardous materials would be distributed at an estimated 0.58 lb per nm^2 (0.08kg per km^2) per year. • Expended materials under Alternative 1 would not have a substantial effect on the marine environment.	• There would be a total increase in the weight of expended materials (352,000 lb [160,000 kg]) distributed over 20 percent of the TMAA under Alternative 2. Over 91 percent of the expended items would be naval gun shells or small arms rounds. • Hazardous materials would account for 2.9 percent (10,300 lb [4,680 kg]) per year of expended material, but density of these materials would be approximately 1.2 lb per nm^2. • SINKEX training would result in approximately 70,000 lb per year of expended materials, of which one percent would be considered hazardous. SINKEX would result in a relatively high areal density of expended materials on portions of the TMAA. • Expended materials under Alternative 2 would not have a substantial effect on the marine environment.
	MITIGATION MEASURES: As summarized in Section 3.2.4, the alternatives would contribute small amounts of hazardous materials to the environment. Given the large size of the training area and the expected fate and transport of the constituents, hazardous materials released to the environment by the Proposed Action are not likely to be present at detectable concentrations. Current Navy protective measures, such as hazardous waste management procedures identified in Section 3.2.1.2, would continue to be implemented. No additional mitigation measures would be required under the Preferred Alternative.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.3 Water Resources	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1997, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on water resources would occur. • Aircraft overflights would not involve expenditures of training materials, and thus would not affect water quality.	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1997, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on water resources would occur. • Aircraft overflights would not involve expenditures of training materials, and thus would not affect water quality.	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1997, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on water resources would occur. • Aircraft overflights would not involve expenditures of training materials, and thus would not affect water quality.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• With a distribution of expended materials over 20 percent of the TMAA, the deposition rate of expended materials will be 1.92 items per nm^2 (0.55 items per km^2) per year. • Ordnance constituents and other materials (batteries, fuel, and propellant) from training devices have minimal effect or are below standards. • No long-term degradation of marine water quality.	• An estimated 26-percent increase in expended training materials would occur compared to the No Action Alternative. With a distribution of these materials over 20 percent of the TMAA, the deposition rate of expended items would be 2.40 items per nm^2 (0.69 items per km^2) per year. • Deposition of hazardous materials (i.e., batteries, fuel, and propellant) from expended materials would be minimal (less than ½ lb per nm^2). • No long-term degradation of marine water quality would occur.	• An estimated 160 percent increase in expended training materials would occur, compared to the No Action Alternative. With a distribution of these materials over 20 percent of the TMAA, the deposition rate of expended items would be approximately 4.90 items per nm^2 (1.42 items per km^2) per year. • Impacts from the increase in expended materials would be minimal because most expended materials (97 percent) would be inert in the marine environment. • Assuming deposition over 20% of the TMAA, the amount of hazardous materials from expended materials would be low, approximately 1.2 lb per nm^2 per year.
	MITIGATION MEASURES: Impacts on water resources resulting from the alternatives would be below thresholds that could result in long-term degradation of water resources or affect water quality. Possible impacts to water quality during normal operating conditions would continue to be mitigated by measures identified in Section 3.3.1.2, which include shipboard management, storage, and discharge of hazardous materials and wastes, and other pollution protection measures intended to protect water quality. No additional mitigation measures would be implemented because there would be no significant impacts to water quality.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.4 Acoustic Environment (Airborne)	**NEPA (U.S. Territorial Seas, 0 to 12 nm)**	• Current Navy activities involving aircraft overflights were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. Territorial Seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.	• Current Navy activities involving aircraft overflights were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. Territorial Seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.	• Current Navy activities involving aircraft overflight were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. Territorial Seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	*Surface Ship Noise* • No change from current conditions. No sensitive receptors present. *Aircraft Noise* • No change from current conditions. Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • No change from current conditions. Very short-term noise impacts. No sensitive receptors present at sea.	*Surface Ship Noise* • Minor localized engine noise. No sensitive receptors present. *Aircraft Noise* • Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • Very short-term noise impacts. No sensitive receptors present at sea.	*Surface Ship Noise* • Minor localized engine noise. No sensitive receptors present. *Aircraft Noise* • Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • Very short-term noise impacts. No sensitive receptors present at sea.
	MITIGATION MEASURES: In the TMAA, most Navy training takes place far out to sea and airborne noise levels would primarily affect military personnel operating the equipment/weapon systems producing the noise. Personnel engaged in the exercise wear personal protective equipment and are not considered sensitive receptors for purposes of the EIS/OEIS analysis. No additional noise-specific mitigation measures are required.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.5 Marine Plants and Invertebrates	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Overflights would not affect marine plants and invertebrates.	• Overflights would not affect marine plants and invertebrates.	• Overflights would not affect marine plants and invertebrates.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• Expended materials and the release of munitions constituents and other materials would be distributed across 20 percent of the TMAA (1.9 items per nm^2 [0.5 per km^2]) and have minimal effects on pelagic and benthic communities. More than 97 percent of these items would be from gunshells and small caliber rounds. • Surface or near-surface explosions have the potential to kill or harm individual animals and plants in the immediate vicinity resulting in localized impacts. Given the TMAA size and using conservative estimates, 0.01 explosions would occur per nm^2 (0.003 per km^2) per year resulting in minimal effects. Benthic communities would not be affected by explosions due to water depth.	• Expended materials and the release of munitions constituents and other materials would be distributed across 20 percent of the TMAA (2.4 items per nm^2 [0.7 per km^2]) and have minimal effects on pelagic and benthic communities. More than 93 percent of these items would be from gunshells and small caliber rounds. • Surface or near-surface explosions have the potential to kill or harm individual animals and plants in the immediate vicinity resulting in localized impacts. Given the TMAA size and using conservative estimates, 0.02 explosion would occur per nm^2 (0.006 per km^2) per year resulting in minimal effects. Benthic communities would not be affected by explosions due to water depth. • Localized and temporary impacts to benthic fauna may occur from the PUTR, but no long-term impact is anticipated.	• Expended materials and the release of munitions constituents and other materials would be distributed across 20 percent of the TMAA (4.9 items per nm^2 [1.4 per km^2]) and have minimal effects on pelagic and benthic communities. More than 91 percent of these items would be from gunshells and small caliber rounds. • Surface or near-surface explosions have the potential to kill or harm individual animals and plants in the immediate vicinity resulting in localized impacts. Given the TMAA size and using conservative estimates, 0.14 explosion would occur per nm^2 (0.04 per km^2) per year resulting in minimal effects. Benthic communities would not be affected by explosions due to water depth. • Localized and temporary impacts to benthic fauna may occur from the PUTR, but no long-term impact is anticipated. • Although localized and temporary impacts to the pelagic environment would occur from a SINKEX, the relatively small quantities of materials expended, dispersed as they are over a very large area, would have no adverse physical effects on marine biological resources.
	MITIGATION MEASURES: The Navy has no existing protective measures in place specifically for marine plants and invertebrates. However, marine plants and invertebrates benefit from measures in place to protect marine mammals, sea turtles, and Essential Fish Habitat that are described in full in Chapter 5. As summarized above, and in detail in Section 3.5.2, the actions proposed under the alternatives described in this EIS/OEIS would have minimal impacts on the marine plant and invertebrate communities of the TMAA. Therefore, no resource-specific mitigation measures would be required.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.6 Fish	NEPA (0 - 12 nm)	• Overflights would not adversely affect fish populations or EFH as defined under the MSFCMA.	• Overflights would not adversely affect fish populations or EFH as defined under the MSFCMA.	• Overflights would not adversely affect fish populations or EFH as defined under the MSFCMA.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• Vessel movement, aircraft overflight, weapons firing disturbance, and expended materials would result in minimal harm to fish or EFH. Given the TMAA size and using conservative estimates, the concentration of expended materials would be 1.9 per nm^2 (0.5 per km^2). More than 97 percent of these items would be from gunshells and small caliber rounds. • Explosive ordnance use may result in injury or mortality to individual fish but would not result in impacts to fish populations. Given the TMAA size and using conservative estimates, the concentration of explosive ordnance would be 0.010 per nm^2 (0.003 per km^2). • Activities would not adversely affect fish populations or EFH as defined under the MSFCMA. • May affect ESA-listed fish species. • No effect to designated critical habitat.	• Vessel movement, aircraft overflight, weapons firing disturbance, and expended materials would result in minimal harm to fish or EFH. Given the TMAA size and using conservative estimates, the concentration of expended materials would be 2.4 per nm^2 (0.7 per km^2). More than 93 percent of these items would be from gunshells and small caliber rounds. • Explosive ordnance use may result in injury or mortality to individual fish but would not result in impacts to fish populations. Given the TMAA size and using conservative estimates, the concentration of explosive ordnance would be 0.020 per nm^2 (0.006 per km^2). • Because only a few species of fish may be able to hear the relatively higher frequencies of mid-frequency sonar, sonar used in Navy exercises would result in minimal harm to fish or fish habitat. • Activities would not adversely affect fish populations or EFH as defined under the MSFCMA. • May affect ESA-listed fish species. • No effect to designated critical habitat.	• Vessel movement, aircraft overflight, weapons firing disturbance, and expended materials would result in minimal harm to fish or EFH. Given the TMAA size and using conservative estimates, the concentration of expended materials would be 4.9 per nm^2 (1.4 per km^2). More than 91 percent of these items would be from gunshells and small caliber rounds. • Explosive ordnance use may result in injury or mortality to individual fish but would not result in impacts to fish populations. Given the TMAA size and using conservative estimates, the concentration of explosive ordnance would be 0.142 per nm^2 (0.041 per km^2). • Because only a few species of fish may be able to hear the relatively higher frequencies of mid-frequency sonar, sonar used in Navy exercises would result in minimal harm to fish or fish habitat. • Activities would not adversely affect fish populations or EFH as defined under the MSFCMA. No SINKEXs would be conducted in HAPCs. • May affect ESA-listed fish species. • No effect to designated critical habitat.
	MITIGATION MEASURES: The Navy has no existing protective measures in place specifically for fish. However, habitats associated with fish communities benefit from measures in place to protect marine mammals and sea turtles that are described in full in Chapter 5. As summarized above and in detail in Section 3.6.2, the alternatives proposed in the EIS/OEIS would be expected to affect individual fish and have localized effects on their habitats, but would not affect communities or populations of species or their use of the TMAA. Mitigation measures for at-sea activities involving explosive ordnance, implemented for marine mammals and sea turtles, also offer protections to habitats associated with fish communities. These current protective measures detailed in Chapter 5 (such as utilization of general maritime measures and buffer zones for marine mammals as well as marine vegetative communities) would continue to be implemented, and no further mitigation measures would be needed to protected fish in the TMAA.		

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.7 Sea Turtles	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles.	• Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles.	• Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials. • Potential for exposure to at-sea explosions but occurrence is very unlikely. • No long-term effects would occur. • No Action Alternative may affect ESA-listed leatherback turtles.	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials. • Potential for exposure to at-sea explosions but occurrence is very unlikely. • Because sonars used in the TMAA are above the known hearing range of sea turtles potential for exposure to mid-frequency and high-frequency sources is unlikely. • No long-term effects would occur. • Alternative 1 may affect ESA-listed leatherback turtles.	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials. • Potential for exposure to at-sea explosions but occurrence is very unlikely. • Because sonars used in the TMAA are above the known hearing range of sea turtles potential for exposure to mid-frequency and high-frequency sources is unlikely. • No long-term effects would occur. • Alternative 2 may affect ESA-listed leatherback turtles.
	MITIGATION MEASURES: The comprehensive suite of protective measures and SOPs implemented by the Navy to reduce impacts to marine mammals also serves to mitigate potential impacts on sea turtles. In particular, personnel and watchstander training, establishment of exclusion zones for marine mammals for at-sea explosions, and pre- and post-exercise surveys all serve to reduce or eliminate potential impacts of Navy activities on sea turtles that may be present in the vicinity. The current requirements and practices described in detail in Chapter 5 would continue to be implemented, and no further mitigation measures would be needed to protect leatherback turtles in the TMAA.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.8 Marine Mammals	NEPA (0 - 12 nm)	• Aircraft overflights of U.S. territorial seas would occur at altitudes at or above 15,000 ft (915 m) and have no effect on marine mammals.	• Aircraft overflights of U.S. territorial seas would occur at altitudes at or above 15,000 ft (915 m) and have no effect on marine mammals.	• Aircraft overflights of U.S. territorial seas would occur at altitudes at or above 15,000 ft (915 m) and have no effect on marine mammals.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. No long-term population-level effects. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials. • For at-sea explosions, behavioral effects modeling and accounting for rare species indicates 102 MMPA Level B harassments (80 from sub-TTS and 22 from TTS), one MMPA Level A harassment resulting from slight injury, and no exposures resulting in potential severe injury or mortality. With implementation of mitigation measures, the MMPA Level A harassments should not occur. • All seven ESA-listed species of marine mammals may be affected by one or more stressors resulting from No Action Alternative training activities. All species may be affected by exposures to at-sea explosions.	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. No long-term population-level effects. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials • For at-sea explosions, behavioral effects modeling and accounting for rare species, indicates 137 MMPA Level B harassments (103 from sub-TTS and 34 from TTS), one MMPA Level A harassment from slight injury, and no exposures resulting in potential severe injury or mortality. Mitigation would reduce the number of these harassments. With implementation of mitigation measures the one MMPA Level A harassment should not occur. • For active sonar & other non-sonar acoustic sources, behavioral effects modeling and accounting for rare species indicates 215,519 MMPA Level B harassments (215,053 sub-TTS and 466 from TTS). There is one predicted MMPA Level A harassment from PTS, but with implementation of mitigation measures, this MMPA Level A harassment should not occur. • All seven ESA-listed species of marine mammals may be affected by one or more stressors resulting from Alternative 1 training activities. All species may be affected by exposures to sound from sonar and at-sea explosions.	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. No long-term population-level effects. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials • For at-sea explosions, behavioral effects modeling and accounting for rare species indicates 240 MMPA Level B harassments (170 from sub-TTS and 70 from TTS), four MMPA Level A harassments, and one exposure resulting in potential severe injury or mortality. Mitigation would reduce the number of these harassments. With implementation of mitigation measures, the four MMPA Level A harassments and one severe injury should not occur. Increase in at-sea explosions from SINKEX are offset by area clearance procedures. • For active sonar & other non-sonar acoustic sources, behavioral effects modeling and accounting for rare species indicates 425,551 MMPA Level B harassments (424,620 from sub-TTS and 931 from TTS). There is one predicted MMPA Level A harassment from PTS, but with implementation of mitigation measures, this MMPA Level A harassment should not occur. • All seven ESA-listed species of marine mammals may be affected by one or more stressors resulting from Alternative 2 training activities. All species may be affected by exposures to sound from sonar and at-sea explosions.
	MITIGATION MEASURES: The Navy intends to implement a comprehensive suite of mitigation measures that serve to reduce impacts to marine mammals that might result from Navy training in the TMAA (summarized in Section 3.8.8 and in detail in Section 5.1.7). In particular, personnel and watchstander training, establishment of marine mammal-free exclusion zones for at-sea explosions, and pre- and post-exercise surveys all serve to reduce or eliminate potential impacts of Navy activities on marine mammals that may be present in the vicinity. The current requirements and practices described in detail in Ch. 5 would continue to be implemented, and no further mitigation measures would be needed to protect marine mammals in the TMAA.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.9 Birds	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Due to flight altitude, behavioral responses to overflights in territorial seas are not expected. • Potential for harm to birds from aircraft strikes is extremely low and is not anticipated.	• Due to flight altitude, behavioral responses to overflights in territorial seas are not expected. • Potential for harm to birds from aircraft strikes is extremely low and is not anticipated.	• Due to flight altitude, behavioral responses to overflights in territorial seas are not expected. • Potential for harm to birds from aircraft strikes is extremely low and is not anticipated.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• Harm due to vessel movements is unlikely. • Brief behavioral response to overflights. Low potential for harm to birds from aircraft strikes. • Low potential for harm to birds from ordnance use. • Low potential for harm to birds from explosives use. • Low potential for harm from military expended materials. • Within the TMAA, the single endangered species is the short-tailed albatross. Vessel movements, aircraft overflight, ordnance use, at-sea explosions, and military expended materials (entanglement) may affect, but are not likely to adversely affect, individual ESA-listed seabirds.	• Harm due to vessel movements is unlikely. • Brief behavioral response to overflights. Low potential for harm to birds from aircraft strikes. • Low potential for harm to birds from ordnance use. • Low potential for harm to birds from explosives use. • Low potential for harm from military expended materials. • No considerable harm to birds, migratory birds, bald eagles, federally listed species, or their habitat. • Within the TMAA, the single endangered species is the short-tailed albatross. Vessel movements, aircraft overflight, ordnance use, at-sea explosions, and military expended materials may affect, but not likely to adversely affect, individual ESA-listed seabirds.	• Harm due to vessel movements is unlikely. • Brief behavioral response to overflights. Low potential for harm to birds from aircraft strikes. • Low potential for harm to birds from ordnance use. • Low potential for harm to birds from explosions and impacts. • Low potential for harm from military expended materials. • No considerable harm to birds, migratory birds, bald eagles, federally listed species, or their habitat. • Within the TMAA, the single endangered species is the short-tailed albatross. Vessel movements, aircraft overflight, ordnance use, at-sea explosions, and military expended materials may affect, but not likely to adversely affect, individual ESA-listed seabirds.
	MITIGATION MEASURES: Some of the SOPs and BMPs implemented by the Navy for resource protection that are described in detail in Chapter 5 would also reduce potential effects to birds (e.g., avoidance of birds and their nesting and roosting habitats and monitoring of exclusion zones surrounding at-sea explosions prior to detonations). As summarized above and in detail in Section 3.9.2, the actions proposed in this EIS/OEIS could affect birds within the TMAA, but community- or population-level effects would not be expected under any of the alternatives. Current protective measures would continue to be implemented by the Navy, and no additional mitigation measures would be needed to protect birds or their habitats.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.10 Cultural Resources	**NEPA (U.S. Territorial Seas, 0 to 12 nm)**	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to cultural resources onshore would occur. • Aircraft overflights above 15,000 ft (915 m) altitude between the shore and the TMAA would have no impact on cultural resources.	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to cultural resources onshore would occur. • Aircraft overflights above 15,000 ft (915 m) altitude between the shore and the TMAA would have no impact on cultural resources.	• Under Alternative 2, Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to cultural resources onshore would occur. • Aircraft overflights above 15,000 ft (915 m) altitude between the shore and the TMAA would have no impact on cultural resources.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• Submerged cultural resources would not be impacted because of the type of training activities and the low density of submerged cultural resources within the area of effect.	• Submerged cultural resources would not be impacted because of the type of training activities and the low density of submerged cultural resources within the area of effect.	• Submerged cultural resources would not be impacted because of the type of training activities and the low density of submerged cultural resources within the area of effect.
	MITIGATION MEASURES: The Navy has established protective measures to reduce potential effects on cultural and natural resources from training exercises in coastal waters and for land and sea ranges. Some are generally applicable, while others apply to particular geographic areas or during specific times of year. Protective measures in other locations include avoidance of known shipwreck sites or the use of inert ordnance. Precise and accurate locations for shipwrecks in the TMAA are not known. As summarized above and in detail within Section 3.10.2, no substantial impacts on cultural resources from the proposed activities were identified. Therefore, no additional mitigation measures are necessary or appropriate.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.11 Transportation and Circulation	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to inland transportation and circulation would occur. • With the use of the Altitude Reservation (ALTRV), overflights would have no adverse impact on non-military air or marine traffic.	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to inland transportation and circulation would occur. • With the use of the ALTRV, overflights would have no adverse impact on non-military air or marine traffic.	• Under Alternative 2, Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to inland transportation and circulation would occur. • With the use of the ALTRV, overflights would have no adverse impact on non-military air or marine traffic.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• No adverse effects on commercial or general aviation would occur. Limitations are communicated to commercial airlines and general aviation by Notice to Airmen (NOTAMs). • No adverse effects on marine traffic would occur. When training activities occur within shipping or high traffic areas, these activity areas are communicated to all vessels and operators by NOTMARs published by the USCG.	• Effects on air and marine traffic would be the same as described under the No Action Alternative. No additional impacts on the Federal Aviation Administration's (FAA's) capabilities would be created as a result of proposed training increases under Alternative 1. • Marine traffic will not be affected by military operational increases. • Installation and use of the temporary PUTR will not affect air and marine traffic.	• Effects on air and marine traffic would be the same as described under Alternative 1. There are no adverse effects to air or marine traffic as a result of implementation of Alternative 2. • Marine traffic will not be affected by military operational increases. • Installation and use of the temporary PUTR will not affect air and marine traffic. • With implementation of Letter of Instruction, range clearance procedures, and NOTMARs, SINKEX would not affect non-military transportation and circulation.
	MITIGATION MEASURES: Safety and security factors dictate that use of airspace and control of air traffic be closely regulated. Accordingly, regulations applicable to all aircraft are promulgated by the FAA to define permissible uses of designated airspace, and to control that use. The Navy provides publication of NOTMARs and other outreach information about potentially hazardous activities planned for the TMAA, for publication by the USCG. To ensure the broadest dissemination of information about hazards to commercial and recreational vessels, the Navy provides schedule conflicts along with other Coast Guard concerns via the internet. As summarized above and in detail within Section 3.11.2, no adverse effects on air or marine traffic from the proposed activities were identified. Therefore, no additional mitigation measures are necessary.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.12 Socioeconomics	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to socioeconomics would occur. • Overflights would not result in adverse effects to commercial shipping, commercial fishing, recreation, or tourism.	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to socioeconomics would occur. • Overflights would not result in adverse effects to commercial shipping, commercial fishing, recreation, or tourism.	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to socioeconomics would occur. • Overflights would not result in adverse effects to commercial shipping, commercial fishing, recreation, or tourism.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• No adverse impacts to commercial/recreational fishing, fisheries research/management, civilian access, or tourism would occur as a result of the No Action Alternative.	• No adverse impacts to commercial/recreational fishing, fisheries research/management, civilian access, or tourism would occur as a result of Alternative 1. • Use of the PUTR by Fleet ships and aircraft would have no socioeconomic impact to the region. • Gear placement for the PUTR on the seafloor in a 25-100 nm^2 area could be incompatible with certain commercial fishing activities.	• No adverse impacts to commercial/recreational fishing, fisheries research/management, civilian access, or tourism would occur as a result of Alternative 2. • Use of the PUTR by Fleet ships and aircraft would have no socioeconomic impact to the region. • Gear placement for the PUTR on the seafloor in a 25-100 nm^2 area could be incompatible with certain commercial fishing activities. • SINKEX under Alternative 2 would not result in impacts to fish populations and thus commercial fishing operations.
	MITIGATION MEASURES: Long-range advance notice of scheduled activities and times are made available to the public and the commercial fishing community via the Internet. To minimize potential military/civilian interactions, the Navy would continue to publish scheduled potentially hazardous training activities using the NOTAM and NOTMAR systems as applicable. As summarized above and in detail within Section 3.12.2, no adverse effects to socioeconomics from the proposed activities were identified. Therefore, no additional mitigation measures are necessary.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.13 Environmental Justice and Protection of Children	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to environmental justice or protection of children would occur. • No effects are anticipated from training activities and overflights; no disproportionately high and adverse effects on any low-income or minority groups would occur. • There are no population centers found within the TMAA. Therefore, no effects on children would occur as a result of implementation of the No Action Alternative.	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to environmental justice or protection of children would occur. • No effects are anticipated from training activities and overflights; no disproportionately high and adverse effects on any low-income or minority groups would occur. • There are no population centers found within the TMAA. Therefore, no effects on children would occur as a result of implementation of Alternative 1.	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to environmental justice or protection of children would occur. • No effects are anticipated from training activities and overflights; no disproportionately high and adverse effects on any low-income or minority groups would occur. • There are no population centers found within the TMAA. Therefore, no effects on children would occur as a result of implementation of Alternative 2.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• No permanent human population centers exist in non-U.S. territorial seas and subsistence uses occur mostly outside of the TMAA. Therefore, no impacts related to environmental justice or protection of children would occur.	• No permanent human population centers exist in non-U.S. territorial seas and subsistence uses occur mostly outside of the TMAA. Therefore, no impacts related to environmental justice or protection of children would occur under Alternative 1.	• No permanent human population centers exist in non-U.S. territorial seas and subsistence uses occur mostly outside of the TMAA. Therefore, no impacts related to environmental justice or protection of children would occur under Alternative 2.
	MITIGATION MEASURES: As summarized above and in detail within Section 3.13.2, no adverse effects to environmental justice or protection of children from the proposed activities were identified. Therefore, no additional mitigation measures are necessary.			

Table ES-2: Summary of Effects (continued)

		No Action Alternative	Alternative 1	Alternative 2
3.14 Public Safety	NEPA (U.S. Territorial Seas, 0 to 12 nm)	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on public safety would occur. • Aircraft overflights would not affect public safety because aircraft are limited to flying within the ALTRV and follow FAA guidelines.	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on public safety would occur. • Increase in aircraft overflights would not affect public safety because aircraft are limited to flying within the ALTRV and follow FAA guidelines.	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on public safety would occur. • Increase in aircraft overflights would not affect public safety because aircraft are limited to flying within the ALTRV and follow FAA guidelines.
	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)	• Navy training exercises in the TMAA will not affect public safety. The Navy will issue NOTAMs or NOTMARs to notify the public of training exercises. If non-participants are in the training area, training activities will not proceed until non-participants have left the area.	• Navy training exercises in the TMAA will not affect public safety. The Navy will issue NOTAMs or NOTMARs to notify the public of training exercises. If non-participants are in the training area, training activities will not proceed until non-participants have left the area. • Impacts on public safety would be the same as under the No Action Alternative. • Installation and use of the temporary PUTR will not affect public health or safety.	• Navy training exercises in the TMAA will not affect public safety. The Navy will issue NOTAMs or NOTMARs to notify the public of training exercises. If non-participants are in the training area, training activities will not proceed until non-participants have left the area. • There would be an increase in training tempo and new training activities, but impacts on public safety would be the same as under the No Action Alternative and Alternative 1. • With implementation of SOPs, range clearance procedures, and NOTMARs, SINKEX will not affect public health or safety.
	MITIGATION MEASURES: Navy training activities in the TMAA comply with numerous established safety procedures (Fleet Area Control and Surveillance Facility safety procedures, DoD SOPs, Navy SOPs for aviation and submarine navigation safety, and general exercise safety procedures regarding surface vessels, aircraft, live and inert ordnance, sonar, electromagnetic radiation, and lasers) to ensure that neither participants nor nonparticipants engage in activities that endanger life or property (described in full in Section 3.14.1.2). As summarized above and in detail within Section 3.14.2, no substantial impacts from the proposed activities have been identified. The safety procedures followed by the Navy lower the risk that Navy training activities pose on public safety. No further mitigation measures would be required.		
Note: Throughout Table ES-3, the word "Conservative" is meant to imply the use of assumptions that tend to overestimate.				

ES 1.8 OTHER REQUIRED CONSIDERATIONS

ES 1.8.1 Possible Conflicts with Objectives of Federal, State, and Local Plans, Policies, and Controls

Based on an evaluation with respect to consistency with statutory obligations, the Navy's Alternatives (including the Proposed Action) for the GOA Navy Training Activities Final EIS/OEIS do not conflict with the objectives or requirements of federal, state, regional, or local plans, policies, or legal requirements. Chapter 6, Table 6-1, provides a summary of environmental compliance requirements that may apply.

ES 1.8.2 Relationship between Short-term Uses and Long-term Productivity

The Proposed Action would result in both short- and long-term environmental effects. However, the Proposed Action would not be expected to result in any impacts that would reduce environmental productivity, permanently narrow the range of beneficial uses of the environment, or pose long-term risks to health, safety, or the general welfare of the public. The Navy is committed to sustainable range management, including co-use of the TMAA with the general public and commercial interests to the extent practicable, consistent with accomplishment of the Navy mission and in compliance with applicable law. This commitment to co-use enhances the long-term productivity of the training areas within the ATA.

ES 1.8.3 Irreversible or Irretrievable Commitment of Resources

For the Alternatives, including the Proposed Action, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term and temporary. However, implementation of the Proposed Action would require the use of fuels by aircraft, ships, and ground-based vehicles. Total fuel consumption would increase and this nonrenewable resource would be considered irreversibly lost.

ES 1.8.4 Energy Requirements and Conservation Potential

Increased training activities in the ATA for the Alternatives, including the Proposed Action, would result in an increase in energy demand over the No Action Alternative. Energy requirements would be subject to established energy conservation practices. The use of energy sources has been minimized wherever possible without compromising safety or training activities. No additional conservation measures related to direct energy consumption by the proposed activities are identified.

ES 1.8.5 Natural or Depletable Resource Requirements and Conservation Potential

Resources that would be permanently and continually consumed by project implementation include water, electricity, natural gas, and fossil fuels. Pollution prevention is an important component of mitigation of the Alternatives' adverse impacts. To the extent practicable, pollution prevention considerations are included. Sustainable range management practices are in place that protect and conserve natural and cultural resources; and allow for preservation of access to training areas for current and future training requirements, while addressing potential encroachments that threaten to impact training area capabilities.

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Acronyms and Abbreviations

ACRONYMS/ABBREVIATIONS LIST

A-A	Air-to-Air
A-G	Air-to-Ground
A-S	Air-to-Surface
AAC	Alaska Administrative Code
AAMEX	Air-to-Air Missile Exercise
AAW	Anti-Air Warfare
ABR	auditory brainstem response
AC	Alaska Current
ACC	Alaska Coastal Current
ACHP	Advisory Council on Historic Preservation
ACM	Air Combat Maneuver(ing)
ACMP	Alaska Coastal Management Plan
ADAR	Air Deployed Active Receiver
ADCAP	Advanced Capability
ADCs	Acoustic Device Countermeasures
ADD	Acoustic Deterrent Devices
ADEC	Alaska Department of Environmental Conservation
ADEX	Air Defense Exercise
ADF&G	Alaska Department of Fish and Game
ADH	Acoustic Harassment Devices
ADLFP	Air Deployable Low Frequency Projector
ADNR	Alaska Department of Natural Resources
AEER	Advanced Extended Echo Range
AESA	Airborne Electronically Scanned Array
AESO	Aircraft Environmental Support Office
AFAST	Atlantic Fleet Active Sonar Training
AFB	Air Force Base
AGL	above ground level
AICUZ	Air Installation Compatibility Use Zone
AKR	Alaska Region
AMHS	Alaska Marine Highway System
ALCOM	Alaskan Command
ALTRV	Altitude Reservation
AMCC	Alaska Marine Conservation Council
AMHS	Alaska Marine Highway System
AMRAAM	Advanced Medium-Range Air-to-Air Missile
AMSP	Advanced Multi-static Processing Program
AMW	Amphibious Warfare
ANCSA	Alaska Native Claims Settlement Act
ANILCA	Alaska National Interest Lands Conservation Act
AO	Arctic Oscillation
APE	Area of Potential Effect
ARG	Amphibious Ready Group
ARPA	Archaeological Resources Protection Act
ARS	Advance Ranging Source
ARTCC	Air Route Traffic Control Center
AS	Alaskan Stream
ASG	Alaska Sea Grant
ASHPA	Alaska Seamount Habitat Protection Area
ASTM	American Society for Testing and Materials
ASUW	Anti-Surface Warfare
ASW	Anti-Submarine Warfare
ATA	Alaska Training Area
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
ATSDR	Agency for Toxic Substances and Disease Registry
atm	atmospheres
BA	Biological Assessment
BAMS	Broad Area Maritime Surveillance
BCC	Birds of Conservation Concern
BDA	Battle-Damage Assessment
BDU	Bomb Dummy Unit
BE	Biological Evaluation
BFM	Basic Fighter Maneuvering
BMDS	Ballistic Mission Defense System
BMP	Best Management Practice
BO	Biological Opinion
BOMBEX	Bombing Exercise
BRAC	Base Realignment and Closure
BT	Bathythermograph
ºC	degrees Celsius
C4	Command, Control, Communications, & Computers
C4I	Command, Control, Communications, Computers & Intelligence
CAA	Clean Air Act
cal	caliber
CASS	Comprehensive Acoustic Simulation System
CEO	Chief Executive Officer
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CETAP	Cetacean and Turtle Assessment Program
CFMETR	Canadian Forces Maritime Experimental and Test Ranges
C.F.R.	Code of Federal Regulations
CG	Guided Missile Cruiser
CHAFFEX	Chaff Exercise
CH_4	methane
chl a	chlorophyll a
CIWS	Close-in-Weapon System
cm	centimeters
CMP	Coastal Management Plan
CNO	Chief of Naval Operations
CO	Commanding Officer
CO	carbon monoxide
CO_2	carbon dioxide
COMPACFLT	Commander, U.S. Pacific Fleet
COMPTUEX	Composite Training Unit Exercise
COMSUBPAC	Commander, Submarine Force U.S. Pacific Fleet
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPF	Commander, U.S. Pacific Fleet
CSAR	Combat Search and Rescue
CSG	Carrier Strike Group
CV	Coefficient of Variation
CWA	Clean Water Act
CZ	Coastal Zone
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted decibel
DDG	Guided Missile Destroyer
DDT	Dichloro-Diphenyl-Trichloroethane
DEIS	Draft Environmental Impact Statement
DHS	Department of Homeland Security
DICASS	Directional Command Activated Sonobuoy System

DIFAR	Directional Frequency Analysis and Recording
DLCD	Department of Land Conservation and Development
DLQ	Deck Landing Qualification
DMV	Department of Motor Vehicles
DNL	Day-Night Average Sound Level
DNR	Department of Natural Resources
DNT	dinitrotoluene
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDINST	Department of Defense Instruction
DoN	Department of Navy
DOPAA	Description of Proposed Action and Alternatives
DOT	Department of Transportation
DPS	Distinct Population Segments
DSCA	Defense Support of Civilian Authorities
DTR	Detonation Training Range
DU	depleted uranium
DVD	Digital Versatile Disk
DZ	Drop Zone
EA	Environmental Assessment
EA	Electronic Attack
EC	Electronic Combat
EDMS	Emission and Dispersion Modeling System
EER	Extended Echo Ranging
EEZ	Exclusive Economic Zone
EFD	Energy Flux Density
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EL	Energy Flux Density Level
EMATT	Expendable Mobile Anti-SubmarineWarfare Training Target
EMR	Electromagnetic Radiation
ENP	Eastern North Pacific
EO	Executive Order
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
ES	Executive Summary
ES	Electronic Support
ESA	Endangered Species Act
ESG	Expeditionary Strike Group
ESU	Evolutionary Significant Unit
EW	Electronic Warfare
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FAD	fish aggregating devices
FAO	Food and Agriculture Organization
FDNF	Forward Deployed Naval Forces
FEIS	Final Environmental Impact Statement
FFG	Fast Frigate
FGG	Guided Missile Frigate
FICON	Federal Interagency Committee on Noise
FL	Flight Level
FMC	Fishery Management Council
FMP	Fishery Management Plan
FNSB	Fairbanks North Star Borough
FONSI	Finding of No Significant Impact
FR	Federal Register
FRTP	Fleet Readiness Training Plan
ft	feet
ft^2	square feet
ft^3	cubic feet
ft/sec	feet per second
FTCA	Federal Tort Claims Act
FY	Fiscal Year
g	gram
GAO	U.S. General Accounting Office
GHG	greenhouse gases
GOA	Gulf of Alaska
GOACHPA	Gulf of Alaska Coral Habitat Protection Area
GOASHCA	Gulf of Alaska Slope Habitat Conservation Area
GRAB	Gaussian Ray Bundle
GUNEX	Gunnery Exercise
GWP	Global Warming Potential
H_2	hydrogen
HAPs	hazardous air pollutants
HAPCs	Habitat Areas of Particular Concern
HARM	High-speed Anti-radiation Missile
HARPS	High Frequency Acoustic Recording Packages
HC	Hydrocarbons
HCA	habitat conservation area
HE	High Explosive
HELO	Helicopter
HFA	High Frequency Active
HLX	cyclo-1,3,5-tetramethylene-2,4,6-tetranitramine
HMX	High Melting Explosive (cyclotetramethylene tetranitramine)
HLD	Homeland Defense
H_2O	water
HPA	habitat protection area
hr	hour
HRC	Hawaii Range Complex
HSMSTs	High Speed Maneuverable Surface Targets
H_xF_x	hydrogen fluoride compounds
Hz	hertz
ICAP	Improved Capability
ICES	International Council for Exploration of the Sea
ICMP	Integrated Comprehensive Monitoring Program
ICRMP	Integrated Cultural Resources Management Plan
IED	Improvised Explosive Device
IEER	Improved Extended Echo Ranging
IFH	improved flexible Hose
IFQ	Individual Fishing Quota
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
in	inch(es)
INRMP	Integrated Natural Resources Management Plan
IOC	Initial Operational Capability
IP	Implementation Plan
IPCC	Intergovernmental Panel for Climate Change
IPHC	International Pacific Halibut Commission
ISE	Investigative Science and Engineering
ISR	Intelligence, Surveillance, and Reconnaissance
IUCN	International Union for Conservation of Nature and Natural Resources
IWC	International Whaling Commission
JATO	Jet Assisted Take-Off
JTF	Joint Task Force
JTFEX	Joint Task Force Exercise
JOOD	Junior Officer of the Deck

kg	kilogram(s)
kg/cm^2	kilogram per square centimeter
kg/m^2	kilogram per square meter
kHz	kilohertz
KLGO	Klondike Gold Rush National Historic Park
km	kilometer
km^2	square kilometer
kts	knots
L	liter
LATN	Low-Altitude Tactical Navigation
lb	pound(s)
LCS	Littoral Combat Ship
LFA	Low Frequency Active
LME	Large Marine Ecosystem
LMRS	Long-term Mine Reconnaissance System
LOA	Letter of Authorization
LOP	Letter of Procedure
LZ	Landing Zone
m	meter
m^2	square meter
m^3	cubic meter
m/sec	meters per second
MAA	Maritime Activities Area
MACA	Military Assistance to Civil Authorities
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MCBI	Marine Conservation Biology Institute
MCM	Mine Countermeasures
METOC	Meteorological and Oceanographic Operations
MEU	Marine Expeditionary Unit
MFA	Mid-Frequency Active
mg	milligrams
MI	Maritime Interdiction
mi	mile(s)
mi^2	square miles
min	minute
MI	Maritime Interdiction
MIO	Maritime Interdiction Operations
MISSILEX	Missile Exercise
MIW	Mine Warfare
mL	milliliter
mm	millimeters
MMAs	Marine Management Areas
MMA	Multimission Maritime Aircraft
MMPA	Marine Mammal Protection Act
MMR	Military Munitions Rule
MOA	Military Operations Area
MOU	Memorandum of Understanding
MPA	Maritime Patrol Aircraft
MPA	Marine Protected Area
MPPRCA	Marine Plastic Pollution Research and Control Act
MPRSA	Marine Protection, Research, and Sanctuaries Act
MRA	Marine Resource Assessment
ms	millisecond
MSAT	Marine Species Awareness Training
MSE	Multiple Successive Explosions
MSL	Mean Sea Level
MSFCMA	Magnuson-Stevens Fishery Conservation Management Act
MTR	Military Training Routes
µg	microgram
µm	micron (micrometer)
µPa	micropascal
µPa-m	micropascal at 1 meter
µPa @ 1 m	micropascal at 1 meter
μPa^2-m	micropascal squared at 1 meter
μPa^2-s	micropascal squared in 1 second
μPa^2-sec	micropascal squared in one second
µs	microsecond
MTR	Military Training Route
N	north
N_2	nitrogen
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NAS	Naval Air Station
NATO	North Atlantic Treaty Organization
NAVEDTRA	Naval Education and Training Command
NAVFAC	Naval Facilities Engineering Command
NAVFAC NW	Naval Facilities Engineering Command Northwest
NAVFAC PAC	Naval Facilities Engineering Command Pacific
NAVINSTR	Naval Instruction
NAVSEA	Naval Sea Systems Command
NAVSEAINST	Naval Sea Systems Command Instruction
NCA	National Command Authority
NEPA	National Environmental Policy Act
NEW	Net Explosive Weight
NFEA	National Fishery Enhancement Act
NH_3	ammonia
NHPA	National Historic Preservation Act
nm	nautical miles
nm^2	square nautical miles
NMFS	National Marine Fisheries Service
NMFS-OPR	National Marine Fisheries Service-Office of Protective Resources
NMS	National Marine Sanctuary
NMSA	National Marine Sanctuaries Act
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NORAD	North American Aerospace Defense Command
NORTHCOM	U.S. Northern Command
NOTAM	Notice to Airmen
NOTMAR	Notice to Mariners
NOx	nitrogen oxide
NPC	North Pacific Current
NPDES	National Pollutant Discharge Elimination System
NPFMC	North Pacific Fishery Management Council
NPS	National Park Service
NRC	National Research Council
NRHP	National Register of Historic Places
NSC	Navy Safety Center
NSCT-1	Naval Special Clearance Team ONE
NSW	Naval Special Warfare
NSWC	Naval Surface Warfare Center
NSWG	Naval Special Warfare Group
N-UCAS	Navy Unmanned Combat Air System

NWR	National Wildlife Refuges
NWTRC	Northwest Training Range Complex
O_3	ozone
OCE	Officer Conducting the Exercise
OCM	Oil Content Monitor
OCS	Outer Continental Shelf
OEA	Overseas Environmental Assessment
OEIS	Overseas Environmental Impact Statement
OLF	Outlying Landing Field
OOD	Officer of the Deck
OP	Operational Procedures
OPA	Oil Pollution Act of 1990
OPAREA	Operating Area
OPNAV	Office of the Chief of Naval Operations
OPNAVINST	Chief of Naval Operations Instruction
OTB	Over the Beach
oz	ounce
PACFIRE	Pre-Action Calibration Firing
PACFLT	Pacific Fleet
PACOM	U.S. Pacific Command
PAH	polycyclic aromatic hydrocarbons
Pa•s	Pascal•seconds
Pb	lead
PBX	Plastic Bonded Explosives
PCB	polychlorinated biphenyl
PCE	Primary Constituent Element
PDO	Pacific Decadal Oscillation
PETN	pentaerythritoltrinitramine
PFMC	Pacific Fisheries Management Council
pH	alkalinity
PM	particulate matter
PM2.5	particulate matter up to 2.5 micrometers (microns)
PM10	particulate matter up to 10 micrometers (microns)
PMAP	Protective Measures Assessment Protocol
PMAR	Navy Primary Mission Area
POPs	Persistent Organic Pollutants
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
PR	Personnel Recovery
psi	pounds per square inch
PSC	Pacific Salmon Commission
PST	Pacific Salmon Treaty
psu	practical salinity units
PTS	Permanent Threshold Shift
PUTR	Portable Undersea Tracking Range
PVC	Polyvinyl Chloride
R-	Restricted Area
RA	Restricted Area
RAM	Rolling Airframe Missile
RCD	Required Capabilities Document
RCRA	Resource Conservation and Recovery Act
RDT&E	Research, Development, Test and Evaluation
RDX	Royal Demolition Explosive (cyclotrimethylene trinitramine)
RF	Radio Frequency
RHA	Rivers and Harbors Act
RL	Received level
rms	root mean square
ROD	Record of Decision
ROG	reactive organic gases
ROI	Region of Influence
RSO	Range Safety Officer
S-A	Surface-to-Air
S-S	Surface-to-Surface
SAM	Surface-to-Air Missile
SAMEX	Surface to Air Missile Exercise
SBUs	Special Boat Units
SCUBA	self-contained underwater breathing apparatus
S.D.	Standard Deviation
SDVT-1	SEAL Delivery Vehicle Team ONE
SEAD	Suppression of Enemy Air Defenses
SEAL	Sea, Air, Land
sec	second
SFA	Sustainable Fisheries Act
SFH	Strong Flexible Hose
SHPO	State Historic Preservation Officer
SINKEX	Sinking Exercise
SIP	State Implementation Plan
SLAM-ER	Standoff Land Attack Missile-Expanded Response
SMA	Shoreline Management Act
SME	Subject Matter Experts
SNS	Sympathetic Nervous System
SO_2	sulfur dioxide
SO_x	sulfur oxides
SOCAL	Southern California
SOF	Special Operations Forces
SONAR	Sound Navigation and Ranging
SOP	Standard Operating Procedure
SPL	Sound Pressure Level
SPLASH	Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific)
SRA	Source Receptor Areas
SSC	Sea Surface Control
SSG	Surface Strike Group
SSGN	Guided Missile Submarines
SSN	Fast Attack Submarine
SSTs	sea surface temperatures
STW	Strike Warfare
SUA	Special Use Airspace
SURTASS	Surveillance Towed Array Sensor System
SUS	Signal, Underwater Sound
SUW	Surface Warfare
TALD	Tactical Air Launched Decoy
TAP	Tactical Training Theater Assessment Planning
TDU	Target Drone Unit
TMAA	Temporary Maritime Activities Area
TMDL	Total Maximum Daily Load
TNT	trinitrotoluene
TPY	tons per year
TRACKEX	Tracking Exercise
TS	Threshold Shift
TSCA	Toxic Substances Control Act
TTS	Temporary Threshold Shift
TM	Tympanic Membrane
UAS	Unmanned Aerial System
UAV	Unmanned Aerial Vehicle
ULT	Unit Level Training
UME	Unusual Mortality Event
UNDS	Uniform National Discharge Standards
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force

U.S.C.	United States Code
USCG	United States Coast Guard
USDOI	U.S. Department of the Interior
USEPA	U.S. Environmental Protection Agency
USFF	United States Fleet Forces
USFWS	United States Fish and Wildlife Service
USJFCOM	United States Joint Forces Command
USW	Undersea Warfare
UUV	Unmanned Underwater Vehicle
UXO	Unexploded Ordnance
VBSS	Visit Board Search and Seizure
VFR	Visual Flight Rules
VLAD	Vertical Line Array Directional Frequency Analysis and Recording
VOI	Vessel of Interest
VMC	Visual Meteorological Conditions
VTNF	Variable, Timed, Non-Fragmentation
VTS	Vessel Traffic Service
VTUAS	Vertical Takeoff and Landing Unmanned Aerial System
W-	Warning Area
W	west
XO	Executive Officer
yd	yard(s)
yr	year
ZOI	Zone of Influence

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Glossary

MASTER GLOSSARY OF TERMS

Term	Definition
Acoustics	The scientific study of sound, especially of its generation, transmission, and reception.
Active sonar	Detects objects by creating a sound pulse, or ping, that transmits through the water and reflects off the target, returning in the form of an echo. This is a two-way transmission (source to reflector to receiver).
Alternative	A different method for accomplishing the Proposed Action. An alternative can consist of the same action in a different location, or a modification to the Proposed Action.
Ambient noise	The typical or persistent environmental background noise present in the ocean.
Anadromous	Species of fish that are born in freshwater, migrate to the ocean to grow into adults, and return to freshwater to spawn.
Anthropogenic noise	Noise related to, or produced by, human activities.
Anti-Submarine Warfare (ASW)	Naval operations that involves the detection, tracking and potential engagement of submarines their supporting forces, and operating bases that demonstrate hostile intent or are declared hostile by appropriate authority.
Baleen	In some whales (see Mysticete below), the parallel rows of fibrous plates that hang from the upper jaw and are used for filter feeding.
Bathymetry	The measurement of water depth at various places in a body of water; the information derived from such measurements.
Behavioral effect	Defined in this EIS/OEIS as a variation in an animal's behavior or behavior patterns that results from an anthropogenic acoustic exposure and exceeds the normal daily variation in behavior, but which arises through normal physiological process (it occurs without an accompanying physiological effect).
Benthic	Referring to the bottom-dwelling community of organisms that creep, crawl, burrow, or attach themselves to either the sea bottom or such structures as ships, buoys, and wharf pilings (e.g., crabs, clams, worms).
Bight	Refers both to a bend in the shoreline, and to the wide bay which is formed by such a bend.
Biologically important activities/behaviors	Those activities or behaviors essential to the continued existence of a species, such as migration, breeding/calving, or feeding.
Biological Opinion	A document that is the result of Endangered Species Act, Section 7 formal consultation. This document states the opinion of the Service on whether or not a Federal action is likely to adversely affect or jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat and, if so, the Service provides recommendations to minimize or avoid adverse impacts.
Cetacean	An order of aquatic mammals such as whales, dolphins, and porpoises.
Condition Code	A method for evaluating the stage of decomposition of a stranded animal or carcass. Codes range from live animals (Code 1) to skeletal remains (Code 5) (modified from Marine Mammals Ashore: A Field Guide for Strandings by J.R. Geraci and V.J. Lounsbury).

MASTER GLOSSARY OF TERMS (continued)

Term	Definition
Critical habitat	Critical habitat is defined in Section 3 of the Endangered Species Act (ESA) as (1) the specific areas within the geographical area occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features (i) essential to the conservation of the species, and (ii) that may require special management considerations or protection; and (2) specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions.
Decibel (dB)	A unit used to express the relative difference in power, usually between acoustic or electrical signals, equal to 10 times the common logarithm of the ratio of the two levels. Since the decibel scale is exponential and not linear, a 20-dB sound is 10 times louder than a 10-dB sound, and a 30-dB sound is 100 times louder than a 10-dB sound.
Demersal	Living at or near the bottom of a waterbody, but having the capacity for active swimming. Term used particularly when describing various fish species.
Distinct population segment (DPS)	A vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The ESA provides for listing species, subspecies, or distinct population segments of vertebrate species.
Endangered species	Any species that is in danger of extinction throughout all or a significant portion of its range (ESA §3[6]).
Energy flux density level (EFDL)	The energy traversing in a time interval over a small area perpendicular to the direction of the energy flow, divided by that time interval and by that area. EFDL is stated in dB re 1 μPa^2-s for underwater sound.
Epifauna	Organisms living on the surface of the sediment/sea bed/substrate.
Essential fish habitat (EFH)	Those waters and substrate that are defined within Fishery Management Plans for federally managed fish species as necessary to fish for spawning, breeding, feeding, or growth to maturity.
Evolutionary Significant Unit (ESU)	A stock that is reproductively isolated from other stocks of the same species and which represents an important part of the evolutionary legacy of the species. An ESU is treated as a species for purposes of listing under the ESA. National Marine Fisheries Service (NMFS) uses this designation.
Exclusive Economic Zone (EEZ)	A maritime zone adjacent to the territorial sea that may not extend beyond 200 nautical miles from the baselines from which the breadth of the territorial sea is measured.

MASTER GLOSSARY OF TERMS (continued)

Term	Definition
Exhibiting Indicators of Distress	Animals exhibiting an uncommon combination of behavioral and physiological indicators typically associated with distressed or stranded animals. This situation would be identified by a qualified individual and typically includes, but is not limited to, some combination of the following characteristics: 1) Marine mammals continually circling or moving haphazardly in a tightly packed group – with or without a member occasionally breaking away and swimming towards the beach. 2) Abnormal respirations including increased or decreased rate or volume of breathing, abnormal content or odor. 3) Presence of an individual or group of a species that has not historically been seen in a particular habitat, for example a pelagic species in a shallow bay when historic records indicate that it is a rare event. 4) Abnormal behavior for that species, such as abnormal surfacing or swimming pattern, listing, and abnormal appearance.
Expended materials	Those munitions, items, devices, equipment and materials which are uniquely military in nature, and are used and expended in the conduct of the military training and testing mission, such as sonobuoys, flares, chaff, drones, targets, bathymetry measuring devices and other instrumentation, communications devices, and items used as training substitutes. This definition may also include materials expended (such as propellants, weights, guidance wires) from items typically recovered, such as aerial target drones and practice torpedoes.
Federal Register	The official daily publication for actions taken by the federal government, such as Rules, Proposed Rules, and Notices of federal agencies and organizations, as well as Executive Orders and other Presidential documents.
Frequency	Description of the rate of disturbance, or vibration, measured in cycles per second. Cycles per second are usually referred to as hertz, or Hz, the unit of measure.
Harassment	As defined in this document, harassment is an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.
High-frequency	As defined in this document, frequencies greater than 10 kilohertz (kHz).
Hydrography	The characteristic features (e.g., flow, depth) of bodies of water.
Hydrophone	An underwater receiver used to detect the pressure change caused by sound in the water. That pressure is converted to electrical energy. It can then be translated to something that can be heard by the human ear. Sometimes the detected acoustic pressure is outside the human range of hearing.
Infauna	Animals living within the sediment.
Isobath	A line on a chart or map connecting points of equal depths; bathymetric contour.

MASTER GLOSSARY OF TERMS (continued)

Term	Definition
Letter of authorization (LOA)	The Marine Mammal Protection Act provides for a "small take authorization" (i.e., letter of authorization) for maritime activities, provided NMFS finds that the takings would be of small numbers (i.e., taking would have a negligible impact on that species or stock), would have no more than a negligible impact on those marine mammal species not listed as depleted, and would not have an unmitigable adverse impact on subsistence harvests of these species.
Level A harassment	Level A harassment includes any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild. Injury is identified as the destruction or loss of biological tissue. The destruction or loss of biological tissue will result in an alteration of physiological function that exceeds the normal daily physiological variation of the intact tissue.
Level A harassment zone	Extends from an acoustic or impulsive source out to the distance and exposure at which the slightest amount of injury is predicted to occur. The acoustic exposure that produces the slightest degree of injury is therefore the threshold value defining the outermost limit of the Level A harassment zone.
Level B harassment	Level B harassment includes all actions that disturb or are likely to disturb a marine mammal or marine mammal stock in the wild through the disruption of natural behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering but which does not have the potential to injure a marine mammal or marine mammal stock in the wild. Unlike Level A harassment, which is solely associated with physiological effects, both physiological and behavioral effects have the potential to cause Level B harassment.
Level B harassment zone	Begins just beyond the point of slightest injury and extends outward from that point. It includes all animals that may potentially experience Level B harassment. Physiological effects extend beyond the range of slightest injury to a point where slight temporary distortion of the most sensitive tissue occurs, but without destruction or loss of that tissue. The animals predicted to be in this zone experience Level B harassment by virtue of temporary impairment of sensory function (altered physiological function) that can disrupt behavior.
Low-frequency	As defined in this document, frequencies less than 1 kHz.
Masking	The obscuring of sounds of interest by interfering sounds, generally at the same frequencies.
Mid-frequency	As defined in this document, frequencies between 1 kHz and 10 kHz.
Mitigation measure	Measures that will minimize, avoid, rectify, reduce, eliminate, or compensate for significant environmental effects.
Munitions (military)	All ammunition products and components produced or used by or for the U.S. Department of Defense, or the U.S. Armed Services for national defense and security, including military munitions under the control of the Department of Defense, the U.S. Coast Guard, the U.S. Department of Energy, and the National Guard.
Mysticete	Any whale of the suborder Mysticeti having plates of whalebone (baleen plates) instead of teeth. Mysticetes are filter-feeding whales, also referred to as baleen whales, such as blue, fin, gray, and humpback whales.

MASTER GLOSSARY OF TERMS (continued)

Term	Definition
Notice of Intent (NOI)	A written notice published in the *Federal Register* that announces the intent to prepare an EIS. Also provides information about a proposed federal action, alternatives, the scoping process, and points of contact within the lead federal agency regarding the EIS.
Odontocete	Any toothed whale (without baleen plates) of the suborder Odontoceti such as sperm whales, killer whales, dolphins, and porpoises.
Onset permanent threshold shift (onset PTS)	PTS (defined below) is nonrecoverable and, by definition, must result from the destruction of tissues within the auditory system. PTS therefore qualifies as an injury and is classified as Level A harassment under the wording of the Marine Mammal Protection Act. In this EIS/OEIS, the smallest amount of PTS (onset PTS) is taken to be the indicator for the smallest degree of injury that can be measured. The acoustic exposure associated with onset PTS is used to define the outer limit of the Level A harassment zone
Onset temporary threshold shift (onset TTS)	TTS (defined below) is recoverable and is considered to result from the temporary, noninjurious distortion of hearing-related tissues. In this EIS/OEIS, the smallest measurable amount of TTS (onset TTS) is taken as the best indicator for slight temporary sensory impairment. Because it is considered no-injurious, the acoustic exposure associated with onset TTS is used to define the outer limit of the portion of the Level B harassment zone attributable to physiological effects. This follows from the concept that hearing loss potentially affects an animal's ability to react normally to the sounds around it. Therefore, the potential for TTS qualifies as a Level B harassment that is mediated by physiological effects upon the auditory system.
Ordnance	Explosives, chemicals, pyrotechnics, and similar stores (e.g., bombs, guns and ammunition, flares, smoke, or napalm).
Passive sonar	Detects the sound created by an object (source) in the water. This is a one-way transmission of sound waves traveling through the water from the source to the receiver.
Pelagic	Pelagic is a broad term applied to species that inhabit the open, upper portion of marine waters rather than waters adjacent to land or near the sea floor.
Permanent threshold shift (PTS)	Exposure to high-intensity sound may result in auditory effects such as noise-induced threshold shift, or simply a threshold shift (TS). If the TS becomes a permanent condition, generally as a result of physical injury to the inner ear and hearing loss, it is known as PTS.
Phase 1 Investigation	A Phase 1 Investigation, for the purposes of this document, will typically include the following tests and procedures (which are described in NMFS' Biomonitoring Protocols): 1) Demographics of the stranding, environmental parameters. 2) Behavioral assessment of group. 3) Live animal (physical examination, blood work, diagnostics such as AEP or ultrasound, assessment or treatment) or dead animal (External examination and external human interaction evaluation, morphometrics, photographs, diagnostic imaging including CT/MRI scans or ultrasound as appropriate and feasible, and necropsy with internal examination, descriptions, photographs and sample collection).

MASTER GLOSSARY OF TERMS (continued)

Term	Definition
Phase 2 Investigation	A Phase 2 Investigation, for the purposes of this document, will typically include the following tests and procedures (which are described in NMFS' Biomonitoring Protocols): Analyses and review of diagnostic imaging obtained in Phase I, histopathology, special stains, ancillary diagnostics (e.g., PCR for infections, gas emboli), CT of ears, additional diagnostic imaging as needed, histology of ears, case summaries, and review
Physiological effect	Defined in the EIS/OEIS as a variation in an animal's physiology that results from an anthropogenic acoustic exposure and exceeds the normal daily variation in physiological function.
Ping	Pulse of sound created by a sonar.
Pinger	A pulse generator using underwater sound transmission to relay data such as subject location.
Pinniped	Any member of a suborder (Pinnipedia) of aquatic carnivorous mammals (i.e., seals and sea lions) with all four limbs modified into flippers.
Platform	A vessel, pier, barge, etc. from which test systems can be deployed.
Predation	A biological interaction where a predator organism feeds on another living organism or organisms known as prey. The act of predation results in the ecologically significant death of the prey.
Qualified	NMFS has a rigorous set of standards and training in place to qualify stranding responders, however, since the stranding network is a largely volunteer network, there is significant variability from one area to another. In the Biomonitoring Protocol, NMFS will identify the minimum qualifications necessary for individuals to make the determinations necessary to carry out this plan. These qualifications are currently in development and will be finalized in the Biomonitoring Protocols. Not all qualified individuals (veterinarians, technicians, etc.) will be NMFS employees. However, only specific individuals (NMFS Protected Resources, HQ – senior administrators) indicated in the GOA Stranding Communication Protocol will be empowered to advise the Navy of the need to implement shutdown procedures.
Received level	The level of sound that arrives at the receiver, or listening device (hydrophone). The received level is the source level minus the transmission losses from the sound traveling through the water.
Record of Decision (ROD)	A concise summary of the decision made by the project proponent (e.g., Navy) from the alternatives presented in the Final EIS. The ROD is published in the *Federal Register*.
Resonance	A phenomenon that exists when an object is vibrated at a frequency near its natural frequency of vibration – the particular frequency at which the object vibrates most readily. The size and geometry of an air cavity determine the frequency at which the cavity will resonate.

MASTER GLOSSARY OF TERMS (continued)

Term	Definition
Shutdown Procedures	The act of the Navy ceasing operation of sonar or explosive detonations within a designated area for a designated time. The time is designated by the Restart Procedures. The designated area, for the purposes of this document, is an area within 14 nm of any live, in the water animal involved in the USE. This distance (14 nm) is the distance at which sound from the sonar source is anticipated to attenuate to approximately 140-145 dB (SPL). If this distance appears too short (i.e., the proximity of sonar use may likely be deterring the animals from returning to the open water), NMFS and the Navy will further coordinate to determine what measures are necessary to further minimize that likelihood and implement those measures as appropriate.
Scoping	An early and open process with federal and state agencies and interested parties to identify possible alternatives and the significant issues to be addressed in an EIS.
Sonobuoy	A device launched from an aircraft to determine environmental conditions for determination of best search tactics, to communicate with friendly submarines, and to conduct search, localization, tracking, and, as required, attack of designated hostile platforms. Sonobuoys provide both a deployable acoustical signal source and reception of underwater signals of interest.
Sound Navigation and Ranging (Sonar)	Any anthropogenic (man-made) or animal (e.g., bats, dolphins) system that uses transmitted acoustic signals and echo returns for navigation, communication, and determining position and bearing of a target. There are two broad types of anthropogenic sonar: active and passive.
Sound pressure level (SPL)	A measure of the root-mean square, or “effective,” sound pressure in decibels. SPL is expressed in dB re 1 µPa for underwater sound and dB re to 20 µPa for airborne sound.
Source level	The sound pressure level of an underwater sound as measured one meter from the source.
Substrate	Any object or material upon which an organism grows or to which an organism is attached.
Tactical Sonar	A category of sonar emitting equipment that includes surface ship and submarine hull-mounted active sonars.
Take	Defined under the Marine Mammal Protection Act as "harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect."
Temporary threshold shift (TTS)	Exposure to high-intensity sound may result in auditory effects such as noise-induced threshold shift, or simply a threshold shift (TS). If the TS recovers after a few minutes, hours, or days it is known as a Temporary Threshold Shift (TTS).
Threatened species	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (ESA §3[20]).
Threshold Shift (TS)	Lower level exposures to sound levels of sufficient duration may cause permanent or temporary hearing loss; such an effect is called a noise-induced threshold shift, or simply a TS. A TS may be either permanent, in which case it is called a PTS, or temporary, in which case it is called a TTS.

MASTER GLOSSARY OF TERMS (continued)

Term	Definition
Transmission loss	Energy losses that occur as the pressure wave, or sound, travels through the water. The associated wavefront diminishes due to the spreading of the sound over an increasingly larger volume and the absorption of some of the energy by water.
Uncommon Stranding Event (USE)	A stranding event that takes place during an MTE and involves any one of the following: 1) Two or more individuals of any cetacean species (i.e., could be two different species, but not including mother/calf pairs, unless of species of concern listed in next bullet) found dead or live on shore within a two day period and within 10 miles of one another, 2) A single individual or mother/calf pair of any of the following marine mammals of concern to be designated by NMFS at a later date, or 3) A group of 2 or more cetaceans of any species exhibiting indicators of distress.

1 Purpose and Need of the Proposed Action

1 PURPOSE AND NEED OF THE PROPOSED ACTION

1.1 INTRODUCTION

The National Environmental Policy Act of 1969 (NEPA) (42 United States Code [U.S.C.] § 4321 *et seq.*) requires federal agencies to examine the environmental effects of major federal actions in an Environmental Impact Statement (EIS), which is a detailed public document that provides an assessment of the potential effects that a major federal action may have on the human, natural, or cultural environment. Executive Order (EO) 12114, *Environmental Effects Abroad of Major Federal Actions*, directs federal agencies to provide for informed decision-making for major federal actions outside United States (U.S.) territory in an Overseas EIS (OEIS). The U.S. Department of the Navy (DoN) is preparing this EIS/OEIS (hereafter referred to as "EIS/OEIS") to assess the potential environmental effects associated with ongoing and proposed naval activities (described in detail in Chapter 2) in the Alaska Training Areas (ATA). The Navy is the lead agency for the EIS/OEIS and Headquarters, National Marine Fisheries Service (NMFS) is a cooperating agency, pursuant to 40 CFR (Code of Federal Regulations) Section 1501.6.

Since the 1990s, the Navy has participated in a major joint training exercise in Alaska and off the Alaskan coast that involves the Departments of the Navy[1], Army, Air Force, and Coast Guard participants reporting to a unified or joint commander who coordinates the activities planned to demonstrate and evaluate the ability of the services to engage in a conflict and carry out plans in response to a threat to national security. Service Secretaries and Combatant Commanders report to the Secretary of Defense. Combatant Commanders are the senior military authority for their assigned area of responsibility. The U.S. Pacific Command (PACOM[2]), based in Hawaii, has the primary warfighting mission to defend the United States and its interests in the Asia-Pacific Region. The U.S. Northern Command (NORTHCOM) has the primary responsibility for homeland defense. Each of these combatant commanders is supported by component commanders comprising forces from the Navy, Army, and Air Force. The Combatant Commanders develop exercises that train the Navy, Army, and Air Force components to execute plans for situations that they identify as potential threats to the United States. PACOM further delegates its authority to several different joint task force commanders including Commander, U.S. Pacific Fleet (PACFLT).

The exercises currently conducted in the GOA alternate annually between a PACOM and a NORTHCOM scenario. Because of the severe environmental conditions during the winter months, the exercises normally occur during the period between April and October. PACOM's scenarios typically center on a major conflict that poses a threat to the United States that requires integration of Navy and Air Force assets with Army units conducting ground warfare in mountainous rural areas. The manner in which the Defense Department deploys its forces to respond to scenarios is relatively consistent, aiding a programmatic analysis at this time.

NORTHCOM's scenarios supporting homeland defense, and the manner in which it deploys its forces, change rapidly as new needs and requirements are identified. Given this information, this comprehensive programmatic analysis cannot adequately capture the broad range of activities that may be possible in a NORTHCOM scenario. As these exercise scenarios are developed, environmental compliance needs will

[1] The Department of the Navy includes the United States Marine Corps. References to Navy training include Marine Corps training.

[2] PACOM is a unified command which includes about 325,000 military personnel from the Army, Navy, Air Force, and Marine Corps (about 20 percent of all active duty U.S. military forces).

be evaluated for each exercise. Hence, this EIS/OEIS analyzes exercises designed to address PACOM's requirements in Alaska. It does not address activities unique to the NORTHCOM-conducted exercises in Alaska.

The exercises have typically occurred within the ATA over a 14-day period during the April – October time frame. The ATA (Figure 1-1) is comprised of three basic components: 1) the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA); 2) U.S. Air Force (Air Force) over-land Special Use Airspace (SUA[3]) and air routes over the GOA and State of Alaska; and 3) U.S. Army (Army) training lands (to include associated airspace). An overview of the ATA is provided in Section 1.3, and a detailed discussion is provided in Chapter 2.

Modern military actions require teamwork between hundreds or thousands of people, and their various equipment, vehicles, ships, and aircraft, all working individually and as a coordinated unit to achieve success. This joint training conducted in the ATA by the services during these exercises allows for an opportunity to train Navy, Air Force, and Army forces simultaneously in an area of diverse terrain over large areas with relatively unconstricted air space.

The Navy's mission is to organize, train, equip, and maintain combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This mission is mandated by federal law (Title 10 U.S.C. § 5062), which ensures the readiness of the United States' naval forces.[4] The Navy executes this responsibility by establishing and executing training programs, including at-sea training and exercises, and ensuring naval forces have access to the ranges, operating areas, and airspace needed to develop and maintain skills for conducting naval activities.

The purpose of the Proposed Action is to achieve and maintain fleet readiness using the ATA to support and conduct current, emerging, and future training activities.

The need for the Proposed Action is to enable the Navy to meet its statutory responsibility to organize, train, equip, and maintain combat-ready naval forces and to successfully fulfill its current and future global mission of winning wars, deterring aggression, and maintaining freedom of the seas.

The ATA plays a vital part in executing this naval readiness mandate. The training areas serve as a training venue for annual joint training exercises, which can involve forces from the Navy, Air Force, Army, and U.S. Coast Guard (USCG). The Navy's Proposed Action is a step toward ensuring the continued vitality of this essential naval training resource.

This EIS/OEIS assesses environmental effects associated with current and proposed training activities and force structure changes (to include new weapons systems and platforms) in the ATA. Chapter 2 describes in greater detail the alternatives, including the Proposed Action addressed in this EIS/OEIS. In summary, the Navy proposes to implement actions within the ATA to:

- Maintain baseline training activities at current levels;

[3] Special use airspace (SUA) is airspace of defined vertical and lateral limits that has been established by the FAA to segregate air activities, which may be hazardous to non-participating aircraft. Restricted areas, Military Operating Areas (MOAs), and Military Training Routes (MTRs) are examples of different types of SUA.

[4] Title 10, Section 5062 of the United States Code provides: "The Navy shall be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea. It is responsible for the preparation of Naval forces necessary for the effective prosecution of war except as otherwise assigned and, in accordance with Integrated Joint Mobilization Plans, for the expansion of the peacetime components of the Navy to meet the needs of war."

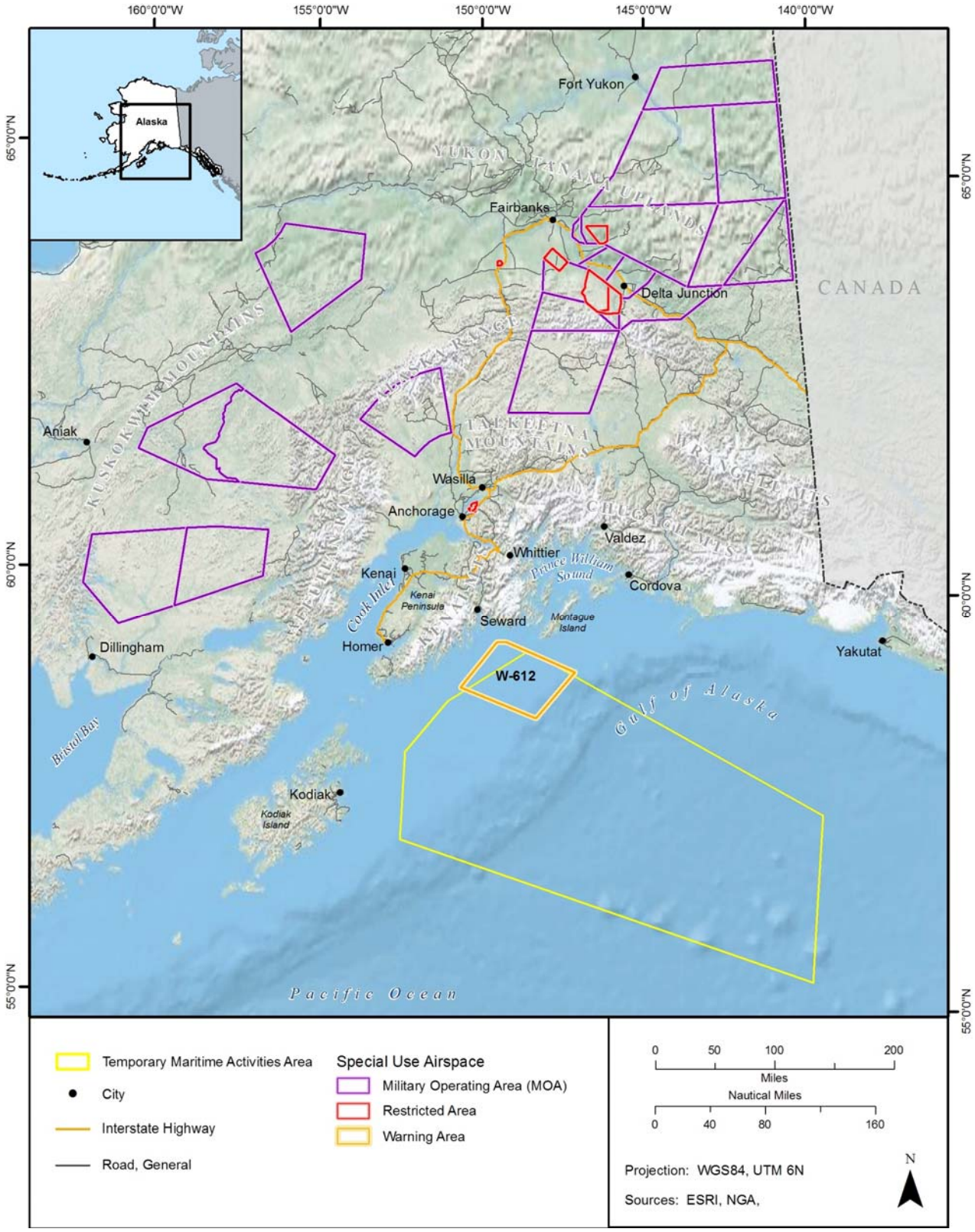


Figure 1-1: Alaska Training Areas

- Increase certain training activities from current levels in order to support the Fleet exercise requirements to include the use of active sonar; and

- Accommodate new training requirements associated with force structure changes and introduction of new weapons and systems to the Fleet.

The No Action Alternative is required by Council on Environmental Quality (CEQ) regulations as a baseline against which the impacts of the Proposed Action are compared. In this EIS/OEIS, the No Action Alternative is represented by current training activities (one joint force exercise occurring over a maximum time period of 14 consecutive days during summer months [April through October]), which provide the analytical baseline.

The Proposed Action would result in selectively focused and critical increases in training activities and levels that are necessary if the Navy is to maintain a state of military readiness commensurate with the national defense mission (conducting up to two joint force level exercises each of which could last up to 21 days between April and October).

The decision to be made by the Navy is to determine the scope and levels of training to be conducted within the ATA, as set forth in the Alternatives discussed in Chapter 2 of this document. To support an informed decision, the EIS/OEIS identifies objectives and criteria for naval training activities in the ATA. The core of the EIS/OEIS is the development and analysis of different alternatives for achieving the Navy's objectives. Alternatives development is a complex process, particularly in the dynamic context of military training. The touchstone for this process is a set of criteria that respond to the naval readiness mandate, as it is implemented in the ATA. The criteria for developing and analyzing alternatives to meet these objectives are set forth in Section 2.3.1. These criteria provide the basis for the statement of the Proposed Action and alternatives and selection of alternatives for further analysis (Chapter 2), as well as analyses of the environmental effects of the Proposed Action and alternatives (Chapter 3). Chapter 2 also discusses alternatives that were considered but eliminated because they do not satisfy the purpose and need or they fail to meet selection criteria.

This EIS/OEIS is being prepared in compliance with NEPA; the CEQ Regulations for Implementing the Procedural Provisions of NEPA (Title 40) Code of Federal Regulations [C.F.R.] Parts [§§] 1500-1508); Department of the Navy Procedures for Implementing NEPA (32 C.F.R. Part 775); and EO 12114, *Environmental Effects Abroad of Major Federal Actions*. The NEPA process ensures that environmental impacts of proposed major federal actions are considered in agency decision making. EO 12114 requires consideration of environmental impacts of actions outside the United States territorial seas. This EIS/OEIS satisfies the requirements of both NEPA and EO 12114.

1.2 BACKGROUND

The U.S. Navy routinely trains and operates in the ATA for national defense purposes. The land, air, and sea space of the ATA have provided, and continue to provide, a safe and realistic training environment for naval and joint forces.

1.2.1 Why the Navy Trains

The U.S. military is maintained to ensure the freedom and safety of all Americans both at home and abroad. In order to do so, Title 10 U.S.C. § 5062 requires the Navy to "maintain, train and equip combat-ready naval forces capable of winning wars, deterring aggression and maintaining freedom of the seas." Modern war and security operations are complex. Modern weaponry has brought both unprecedented opportunity and innumerable challenges to the Navy. Smart weapons, when used properly, are very accurate and actually allow us to accomplish our mission with greater precision and far less destruction

than in past conflicts. But these modern smart weapons are very complex to use. U.S. military personnel must train regularly with them to understand their capabilities, limitations, and operation. As stated above, modern military actions require teamwork between hundreds or thousands of people, and their various equipment, vehicles, ships, and aircraft, all working individually and as a coordinated unit to achieve success. Navy training addresses all aspects of the team, from the individual to multi-service (joint) and coalition teamwork. To do this, the Navy employs a building block approach to training. Training doctrine and procedures are based on operational requirements for deployment of naval forces. Training proceeds on a continuum, from teaching basic and specialized individual military skills, to intermediate skills or small unit training, to advanced, integrated training events, culminating in joint exercises or predeployment certification events.

The Navy's training cycle, Fleet Response Plan, ensures that naval forces achieve and maintain the capabilities to carry out the requirements of combatant commanders. The Navy implements this Plan through the Fleet Response Training Cycle. This cycle involves three basic phases: unit level training; integration training; and sustainment. The exercises that the Navy conducts in the ATA focus on maintaining and improving readiness of forces or the sustainment phase. These exercises also allow the Navy to train in a joint environment. Joint training is invaluable, as most conflicts tend to be fought jointly and the ability of the individual services to work cohesively together while maximizing and exploiting each services' own unique capabilities often times is the difference between success and failure.

To provide the experience so important to success and survival, training must be as realistic as possible. The Navy often employs simulators and synthetic training to provide early skill repetition and to enhance teamwork, but live training in a realistic environment is vital to success. This training requires sufficient sea and airspace to maneuver tactically, realistic targets and objectives, simulated opposition that creates a realistic enemy, and instrumentation to objectively monitor the events to help participants learn to correct errors.

Training areas provide controlled and safe environments that enable Navy forces to conduct realistic combat-like training as they undergo all phases of the graduated buildup needed for combat-ready deployment. These training areas and operating areas provide the space necessary to conduct controlled and safe training scenarios representative of those that our men and women would have to face in actual combat. The training areas are designed to provide the most realistic training in the most relevant environments, replicating to the best extent possible the operational stresses of warfare. The integration of undersea ranges and operating areas with land training ranges is critical to this realism, allowing execution of multidimensional exercises in complex scenarios. Typically, they also provide instrumentation that captures the performance of Navy tactics and equipment in order to provide the feedback and assessment that are essential for constructive criticism of personnel and equipment. The live-fire phase of training facilitates assessment of the Navy's ability to place weapons on target with the required level of precision while in a stressful environment.

Navy training activities focus on achieving proficiency in each of several functional areas encompassed by Navy operations. These functional areas, known as Primary Mission Areas (PMARs), are: Anti-Air Warfare (AAW), Amphibious Warfare (AMW), Anti-Surface Warfare (ASUW), Anti-Submarine Warfare (ASW), Mine Warfare (MIW), Strike Warfare (STW), Electronic Combat (EC), and Naval Special Warfare (NSW). With the exception of MIW and AMW, all PMARs are conducted in the ATA and each training activity addressed in the EIS/OEIS is categorized under a PMAR.

The ATA is one of several areas (Southern California Range Complex, Hawaii Range Complex, Northwest Training Range Complex) used by the Navy for training of operational forces in the northern and eastern Pacific Ocean. As with each Navy training area, the primary mission of the ATA is to provide

a realistic training environment for naval and joint forces to ensure that they have the capabilities and high state of readiness required to accomplish their assigned missions.

Training is focused on preparing for worldwide deployment. Naval forces generally deploy in specially organized units called Strike Groups. A Strike Group may be organized around one or more aircraft carriers, together with several surface combatant ships and submarines, collectively known as a Carrier Strike Group (CSG). A naval force known as a Surface Strike Group (SSG) consists of three or more surface combatant ships. The Navy and Marine Corps deploy CSGs and SSGs on a continuous basis. The number and composition of Strike Groups deployed and the schedule for deployment are determined based on worldwide requirements and commitments.

1.2.2 The Strategic Importance of the Alaska Training Areas

The ATA has a unique combination of attributes that make it a strategically important training venue for the Navy. These attributes include:

Location. The large contingent of Air Force aircraft and Army assets based within a few hundred miles of the TMAA creates the possibility of rare joint training opportunities with Navy forces. The TMAA provides a maritime training venue that is located within flight range of Elmendorf Air Force Base (AFB), Eielson AFB, Fort Richardson, Fort Wainwright, Fort Greely, and their associated air and land training ranges (Figure 1-1). Furthermore, numerous shipping lanes in the GOA and the abundance of commercial vessels on those shipping lanes provide valuable training during exercise scenarios.

Oceanographic conditions. The complex bathymetric and oceanographic conditions, including a continental shelf, submarine canyons, numerous seamounts, and fresh water infusions from multiple sources, create a challenging environment in which to search for and detect submarines in ASW training activities. In the summer, the TMAA provides a safe cold-water training environment.

Area of Training Space. The ATA is one of the largest air, surface, subsurface, and land training areas in the Northern Pacific. Detailed descriptions of these areas are provided in Section 1.3.2. This vast training area provides ample space to support the necessary forces and allow for the full range of activities required of a robust joint training scenario.

1.3 OVERVIEW OF THE ALASKA TRAINING AREAS

1.3.1 Mission

The ATA is the principal training venue for the naval forces that participate in large-scale joint exercises in the Alaska area. Northern Edge[5] is a large-scale joint exercise that has been conducted annually, principally within the TMAA (see Figure 1-2 and Section 1.3.2 for description of the TMAA) for several years. The TMAA meets large-scale joint exercise training objectives to support naval and joint operational readiness by providing a "geographically realistic" training area for U.S. Pacific Command (PACOM), Joint Task Force Commander[6] scenario-based training, and supports the mission requirement

[5] Northern Edge is training exercise that exercises joint interoperability of service component forces by testing and evaluating contingency plans, policies, procedures, command structure, communications, logistics, and operations in a joint environment. The exercise also provides a venue for the development and implementation of joint experimentation in Alaska. Depending on the specific exercise objectives, Northern Edge may also incorporate joint task force training modules and transformation initiatives for air and space operations center employment, defensive counter air, counter surface/maritime interdiction, and personnel recovery.

[6] A Joint Task Force Commander and supporting staff is capable of planning and executing any contingency from relatively small-scale operations, such as noncombatant evacuations or maritime interdiction, to major theater conflict.

of Alaskan Command (ALCOM)[7] to conduct joint training for Alaska-based forces. The strategic vision of the Commander, U.S. Pacific Fleet (CPF) and the Commander, United States Fleet Forces (USFF) is that the training area support naval operational readiness by providing a realistic, live-training environment for forces assigned to the Pacific Fleet and other users with the capability and capacity to support current, emerging, and future training requirements.

1.3.2 Primary Components

The ATA consists of three primary components: the TMAA, the Air Force SUA, and the Army training lands (to include associated airspace). The components of the ATA encompass 42,146 square nautical miles (nm^2) (145,482 square kilometers [km^2]) of sea space, 88,731 nm^2 (305,267 km^2) of SUA (not including the portion of Warning Area 612 [W-612] that falls outside the MAA), and over 2,624 square miles (mi^2) (6,796 km^2) of land area (Army ranges). Each of the primary components of the ATA can be divided into numerous subcomponent training areas, which are described in detail in Chapter 2.

TMAA. The TMAA (see Figure 1-2) is composed of the 42,146 nm^2 (145,482 km^2) of surface and subsurface operating area and overlying airspace that includes the majority of W-612 located over Blying Sound. W-612 is 2,256 nm^2 (8,766 km^2) of SUA. The TMAA is roughly rectangular shaped and oriented from northwest to southeast, approximately 300 nautical miles (nm) (555.6 kilometers [km]) long by 150 nm (277.8 km) wide, situated south of Prince William Sound and east of Kodiak Island. The TMAA is bounded by the following coordinates: 57° 30‘N, 141° 30’W to 59° 36’N, 148° 10’W to 58° 57’N, 150° 04’W to 58° 20’N, 151° 00’W to 57° 16’N, 151° 00’W to 55° 30’N, 142° 00’W. The majority of Navy training activities occur in the TMAA. The specific geographical area of the TMAA supports operational and logistical (time, speed, and distance) challenges associated with real world scenarios that support joint operations within PACOM’s unique area of responsibility. For example, CSG and land based joint operations, both overland and overwater, require air route access to land ranges, proximity to bases where a landing could be made in an emergency, and supportable fuel costs, which includes air-to-air refueling where appropriate. The TMAA provides these requirements.

Air Force Inland Special Use Airspace Training Areas. The ATA includes numerous Air Force airspace areas designated as Restricted Areas (RAs), Military Operations Areas (MOAs) or Visual Flight Rules (VFR) corridors. Other airspace for special use in Alaska consists of Military Training Routes (MTRs), Air Traffic Control Assigned Airspace (ATCAA), Air Refueling Anchors/Tracks, Low-Altitude Tactical Navigation (LATN) areas, Controlled Firing Areas, and Slow Speed Low-Altitude Training Routes. In total, these training areas comprise 46,585 nm^2 (159,782 km^2/61,692 mi^2) of SUA, 43,963 nm^2 (150,789 km^2/58,220 mi^2) of which is instrumented (ability to track, score and replay events), that overlays portions of the State of Alaska, generally to the west and north of Anchorage and to the east of Fairbanks. The Air Force’s SUA in Alaska is among the largest components of SUA in the Air Force’s range inventory, facilitating realistic training involving high speed military aircraft with the capability to traverse extensive airspace very quickly. A significant portion of naval air activity occurs in the Air Force’s SUA.

[7] The mission requirement of ALCOM is to: 1) integrate military activities within Alaska to maximize the readiness of theater forces, 2) expedite deployment of forces from and through Alaska in support of worldwide contingencies, and 3) serve as the JTF headquarters for protection of critical infrastructure and coordination of Military Assistance to Civil Authorities.

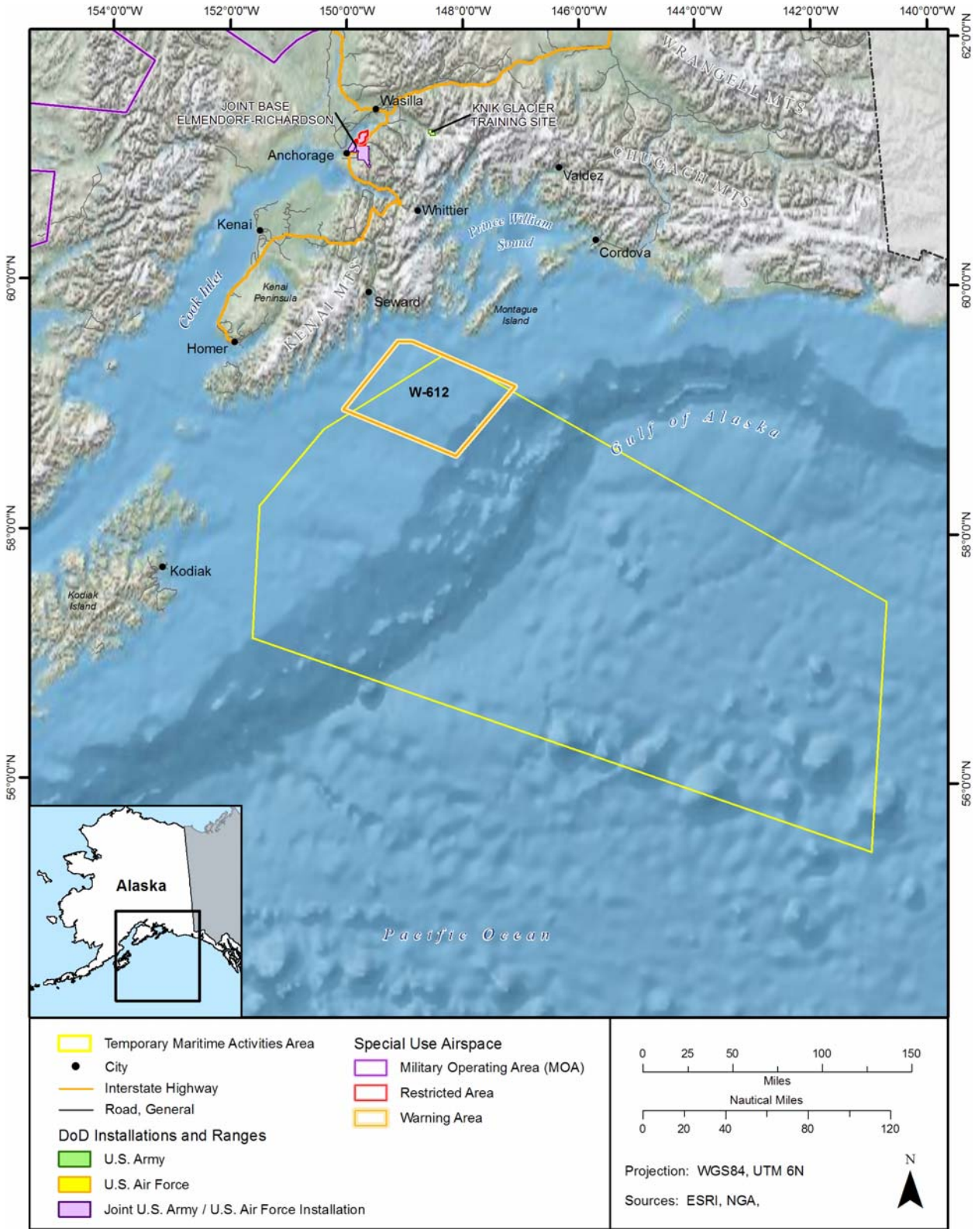


Figure 1-2: Gulf of Alaska Temporary Maritime Activities Area

Army Training Land. The ATA includes numerous Army land training areas that are located both on and off Army installations. In total, these training areas comprise 2,624 mi^2 (1,981 nm^2/6,796 km^2) of land that is located generally to the south and east of Fairbanks, below the Air Force's SUA. The Army's land training areas in Alaska are among the largest of all training areas in the Army's inventory.

These ground training areas provide an extensive suite of capabilities for tactical training, including live-fire training areas for small arms, maneuver areas, and other dedicated areas for the conduct of training. These training areas have extensive instrumentation, and provide opposing force simulation and targets for use in land and air live-fire training. Additionally, these training areas contain airfields, drop zones, landing zones, and other infrastructure for training and logistical support. Combined with the Air Force's SUA, these ground training areas provide Navy and Air Force aircraft the capability to drop live and inert munitions into existing impact areas near instrumented ranges during large, complex flying evolutions.

1.4 PURPOSE AND NEED OF THE PROPOSED ACTION

Given the vital importance of the ATA to the readiness of naval forces and the unique training environment provided by the ATA, the Navy proposes to take actions for the purposes of:

- Supporting PACOM training requirements;
- Supporting Joint Task Force Commander training requirements;
- Achieving and maintaining Fleet readiness using the ATA to support and conduct current, emerging, and future training activities; and
- Expanding warfare missions supported by the training conducted in the ATA, consistent with requirements.

The Proposed Action is needed to continue providing a training environment with the capacity and capabilities to fully support required training tasks for operational units participating in joint exercises, such as the annual Northern Edge exercise. The Navy has developed alternatives criteria based on this statement of the purpose and need for the Proposed Action (see Section 2.3.1).

In this regard, the ATA furthers the Navy's execution of its roles and responsibilities under Title 10. To comply with its Title 10 mandate, the Navy needs to:

- Maintain current levels of military readiness by training in the ATA;
- Accommodate future increases in training activity tempo in the ATA;
- Support the acquisition and implementation into the Fleet of advanced military technology using the ATA to conduct training activities for new platforms and associated weapons systems (EA-18G Growler aircraft, Guided Missile Submarines [SSGN], P-8 Poseidon Multimission Maritime Aircraft [MMA], Guided Missile Destroyer [DDG] 1000 (Zumwalt Class), and several types of Unmanned Aerial Systems [UASs]);
- Identify shortfalls in training, particularly training instrumentation and address through enhancements;
- Maintain the long-term viability of the ATA as a premiere Navy training area while protecting human health and the environment, and enhancing the quality, capabilities, and safety of the training area; and

- Be able to bring Army, Navy, Air Force, and Coast Guard assets together into one geographic area for joint training.

1.5 THE ENVIRONMENTAL REVIEW PROCESS

1.5.1 The National Environmental Policy Act

The National Environmental Policy Act of 1969 requires Federal agencies to examine the environmental effects of their Proposed Actions. An EIS is a detailed public document that provides an assessment of the potential effects that a Federal action might have on the human, natural, or cultural environment. The Navy is the lead agency for the EIS/OEIS as set forth in 40 CFR § 1501.5; NMFS is a cooperating agency as set forth in 40 CFR § 1501.6.

The Navy has prepared an EIS/OEIS for the ATA to assess the effects of ongoing and proposed future activities on the environment. The EIS/OEIS also gives the Navy an opportunity to review its procedures and ensure the benefits of recent scientific and technological advances are applied toward minimizing environmental effects.

The first step in the NEPA process is the preparation of a Notice of Intent (NOI) to develop an EIS/OEIS. The NOI provides an overview of the Proposed Action and the scope of the EIS/OEIS. The NOI for this project was published in the *Federal Register* on March 17, 2008, and in four local newspapers, (*Anchorage Daily News, Kodiak Daily Mirror, Cordova Times, Peninsula Clarion* [see Appendix G for information on the scoping meetings]). The NOI and newspaper notices included information about comment procedures, a list of information repositories (public libraries), the project website address (http://www.GulfofAlaskaNavyEIS.com), and the dates and locations of the scoping meetings.

Scoping is an early and open process for developing the "scope" of issues to be addressed in the EIS/OEIS, and for identifying significant issues related to a Proposed Action. The scoping meetings for this EIS/OEIS were advertised in local newspapers; the advertisements invited public attendance to help define and prioritize environmental issues, and convey these issues to the Navy (see Appendix G for information on the scoping meetings). Comments from the public, as well as from agencies and special interest groups, including the development of alternatives were considered in the preparation of this EIS/OEIS.

Some of the comments received from the public during the scoping process are categorized and summarized in Table 1-1. This table is not intended to provide a complete listing, but to show the extent of the scope of comments.

Subsequent to the scoping process, the Draft EIS/OEIS was prepared to assess the potential effects of the Proposed Action and alternatives on the environment. A Notice of Availability (NOA) was published in the *Federal Register* on December 11, 2009, and notices were placed in the *Anchorage Daily News, Kodiak Daily Mirror, Cordova Times, Peninsula Clarion, and the Juneau Empire to* announce the availability of the Draft EIS/OEIS. The Draft EIS/OEIS was made available for public and agency review and was circulated for review and comment. Public meetings were held in the same geographic venues as the scoping meetings; however, in response to public input, two additional venues were added in Homer and Juneau, Alaska to receive public comments on the Draft EIS/OEIS[8]. Public comments received on the

[8] Public Meetings occurred at: Kodiak High School, Kodiak, AK on January 7, 2010; Fairview Recreation Center, Anchorage, AK on January 8, 2010; West Homer Elementary School, Homer, AK on January 9, 2010; Juneau Arts and Culture Center, Juneau, AK on January 11, 2010; and Orca Adventure Lodge, Cordova, AK on January 12, 2010.

Draft EIS/OEIS are included, along with Navy responses, in Appendix I of this EIS/OEIS. Appendix I contains a copy of all written, website, and oral comments and formal transcripts of the public hearings, including the comments received during the hearings.

Table 1-1: Public Scoping Comment Summary

Category	Comment Summary
Marine Mammals	• Concerns about physical and physiological effects to marine mammals from Navy activities. In particular, injuries from ship strikes and sonar, to include disorientation, strandings, and hearing loss.
Sonar, Sound in the Water	• Desires that the EIS/OEIS consider alternative technologies to mid-frequency active (MFA) sonar. • General feeling that MFA and other forms of sonar are not required for training and should not be conducted within the GOA.
Fish and Marine Habitat	• Concerns about the effects to fish and marine mammal habitats from Navy activities to include migratory routes, feeding grounds, and breeding as well as impacts from hazardous and expended materials..
Mitigation	• Concern about the Navy's training program for spotting animals - The belief that spotting marine mammals is extremely difficult, even for expert observers, and doubts that shipboard lookouts will be able to detect animals in adverse sea conditions - especially at night. • Questions about mitigating the possible adverse impacts to marine mammals from sonar. Belief that, in general, the Navy needs to aggressively consider ways to expand, improve, and employ better protective measures in future and to better identify clear monitoring goals and objectives with specific parameters for measuring success, and provide a feedback mechanism for the public to view information on mitigation effectiveness and monitoring results.
Policy/NEPA Compliance and Public Participation	• Concern that information available during scoping was inadequate to inform comments or that the "poster" session was not the best format. Others desired a more open forum-type format, where all questions voiced could be heard by all. • Request that meeting locations be expanded.
Threatened & Endangered Species	• Concerns about the number of endangered species, particularly whales (seven in total), within the GOA, and designation of critical habitats.
Commercial Fishing	• Concerns about the effects of Navy activities upon fish, their embryos, migration patterns, and the overall impact on the commercial fishing industry and thus the livelihoods of Alaskans in general.

In this Final EIS/OEIS, the Navy has made changes to the Draft EIS/OEIS, based on comments received during the public comment period. These changes included factual corrections, additions to existing information, and improvements or modifications to the analyses in the Draft EIS/OEIS.

The Record of Decision (ROD) reflects the Navy's final decision on the Proposed Action, the rationale behind that decision, and any commitments to monitoring and mitigation. The ROD will be issued by the Navy following the issuance of this Final EIS/OEIS and a 30-day no action period, pursuant to 40 C.F.R. § 1502.2. An NOA of the ROD will be published in the Federal Register, and the ROD will be distributed to agencies and interested parties, and posted on the GOA EIS/OEIS website. Its availability will also be announced in local newspapers.

Navy training activities that occur within the Air Force inland SUA and the Army training lands are analyzed under separate previous NEPA documentation (the *Alaska Military Operations Area EIS* [USAF 1995], *Improvements to Military Training Routes in Alaska Environmental Assessment* [USAF 2007], the

Alaska Army Lands Withdrawal Renewal Final Legislative EIS [Army 1999], and the *Transformation of U.S. Army Alaska FEIS* [Army 2004]). These documents are incorporated by reference which, in NEPA terms, means that the environmental effects of these activities are addressed in these documents. For additional information, see Section 1.6.

1.5.2 Jurisdictional Considerations (Executive Order 12114)

In 1969, Congress enacted NEPA, which provides for the consideration of environmental issues in Federal agency planning and decision-making. Regulations for federal agency implementation of the act were established by the President's CEQ. The EIS must disclose significant environmental impacts and inform decision makers and the public of the reasonable alternatives to the Proposed Action.

Presidential Proclamation 5928, issued December 27, 1988 (54 Fed. Reg. 777, titled 'Territorial Sea of the United States'), extended the exercise of United States sovereignty and jurisdiction under international law to 12 nm; however, the Proclamation expressly provides that it does not extend or otherwise alter existing federal law or any associated jurisdiction, rights, legal interests, or obligations. As a result, the Navy analyzes environmental effects and actions within 12 nm under NEPA and those effects occurring beyond 12 nm under the provisions of EO 12114. Table 1-2 presents a list of training activities (by warfare area) and the geographical area in which they occur (Inland, 0-12 nm, and beyond 12 nm). As shown in Table 1-2, the majority of training activities occur outside of territorial waters (not within 12 nm of shore).

For the majority of resource sections addressed in this Final EIS/OEIS, projected impacts outside of U.S. territorial waters would be similar to those within territorial waters. Beyond 12 nm (22 km) is simply a jurisdictional boundary and is not delineated for purposes of scheduling or management of military training activities. In addition, the baseline environment and associated impacts to the various resource areas analyzed in this Final EIS/OEIS are not substantially different within or outside the 12 nm (22 km) jurisdictional boundary. Therefore, for these resource sections, the impact analyses contained in the main body of the Final EIS/OEIS are comprehensive and follow both NEPA and EO 12114 guidelines. The description of the affected environment addresses areas both within and beyond U.S. territorial sea.

Table 1-2 lists training activities by warfare area, and indicates whether a given activity is addressed pursuant to NEPA (because it occurs within U.S. territory, including the territorial seas) or pursuant to EO 12114 (because it occurs outside the territorial seas).

1.5.3 Government-to-Government Consultations

As part of the EIS/OEIS process and in accordance with EO 13175, Consultation and Coordination with Indian Tribal Governments, the Navy contacted the following federally recognized tribes in Alaska on this document: Afognak, Chenega, Eyak, Kaguyak, Lesnoi Village, Old Harbor, Ouzinke, Port Graham, Port Lions, Shoonaq, Tatitlek, and Yakutat. To date, all tribes have informally (telephonically/verbally) responded that they will not be requesting Government-to-Government consultations.

1.5.4 Regulatory Agency Briefings

The Navy held a series of regulatory agency briefings in November of 2008, with the following regulators: U.S. Fish and Wildlife Service (USFWS) Alaska Region, the Environmental Protection Agency (EPA) Region X, and the Alaska Department of Natural Resources (ADNR) Coastal Zone Management Act (CZMA) staff.

Table 1-2: Training Activities Analyzed under NEPA and EO 12114

Warfare Area	Training Activity	NEPA		EO 12114
		Inland[2]	0-12 NM[3]	Beyond 12 NM
Anti-Air Warfare (AAW)	Aircraft Combat Maneuvers	X	X	X
	Air Defense Exercise		X	X
	Surface-to-Air Missile Exercise (MISSILEX)			X
	Surface-to-Air Gunnery Exercise (GUNEX)		X	X
	Air-to-Air MISSILEX		X	X
Anti-Submarine Warfare (ASW)[1]	Helicopter ASW Tracking Exercise (TRACKEX)			X
	MPA ASW TRACKEX		X	X
	Extended Echo Ranging (EER) ASW Exercises			X
	Surface Ship ASW TRACKEX			X
	Submarine ASW TRACKEX			X
Anti-Surface Warfare (ASUW)	Visit Board Search and Seizure			X
	Air-to-Surface MISSILEX			X
	Air-to-Surface Bombing Exercise (BOMBEX)			X
	Air-to-Surface GUNEX			X
	Surface-to-Surface GUNEX			X
	Maritime Interdiction		X	X
	Sea Surface Control			X
	Sinking Exercise		X	X
Electronic Combat (EC)	EC Exercise	X	X	X
	Chaff Exercise	X	X	X
	Counter Targeting Exercise			X
Naval Special Warfare (NSW)	Insertion/Extraction	X		
Strike Warfare (STW)	Air-to-Ground BOMBEX	X	X	
	Personnel Recovery	X		X
Other Activities				
N/A	Deck Landing Qualification (DLQs)			X

1 – ASW activities are not currently conducted in the TMAA. N/A – Not applicable.
2 - Navy inland activities are a part of the Proposed Action; however, those inland activities are analyzed under existing USAF/Army NEPA documents, including potential increases in training activities.
3 – The only activities that occur within 0-12 nm are aircraft overflights above 15,000 feet.

1.5.5 Coastal Zone Management Act

The *Coastal Zone Management Act* (CZMA) of 1972 (16 U.S.C. § 1451) encourages coastal states to be proactive in managing coastal uses and coastal resources in the coastal zone. The CZMA established a voluntary coastal planning program; participating states submit a Coastal Management Plan (CMP) to the National Oceanographic and Atmospheric Administration (NOAA) Office of Ocean and Coastal Resource Management (OCRM) for approval. Under CZMA, federal actions are required to be consistent, to the maximum extent practicable, with the enforceable policies of approved CMPs.

CZMA defines the coastal zone (16 U.S.C. § 1453) as extending, "to the outer limit of State title and ownership under the Submerged Lands Act." The coastal zone extends inland only to the extent necessary to control the shoreline. Excluded from the coastal zone are lands the use of which is by law subject solely to the discretion of, or which is held in trust by, the federal government (16 U.S.C. § 1453).

Accordingly, federal military lands are not within the coastal zone. In the State of Alaska, CZMA coastal boundaries are determined by each individual Coastal Resource District pursuant to 11 Alaska Administrative Code (AAC) 114.220.

The State of Alaska has an approved CMP, the Alaska Coastal Management Program (ACMP), which was established under the Coastal Management Act of 1977, and is found at Alaska Statutes Annotated (AS) Title 45 Chapter 40. The ACMP received federal approval from the NOAA in 1979 and an amended version of the ACMP was approved by NOAA in December of 2005. The ACMP provides stewardship for Alaska's rich and diverse coastal resources to ensure a healthy and vibrant Alaskan coast that efficiently sustains long-term economic and environmental productivity. The Alaska Department of Natural Resources (ADNR) is the state's designated coastal management agency and is responsible for reviewing projects for consistency with the CMP and issuing coastal management decisions under the provisions of 11 AAC Code Chapters 110. Specific statewide standards for review under the ACMP are found at 11 AAC Chapter 112.

The CZMA federal consistency determination process includes a review of the Proposed Action to determine whether it has reasonably foreseeable direct or indirect effects on coastal zone resources or uses under the provisions of the CMP. An in-depth examination of any such effects, and a determination on whether those effects are consistent to the maximum extent practicable with the state's enforceable policies, is then conducted by the action proponent. Specific standards under the ACMP that appear applicable to proposed training activities occurring in the TMAA are 11 AAC Chapter 112 Sections 300 ("Habitats"), and 310 ("Air, Land, and Water Quality).

For the activities covered in this Final EIS/OEIS, the Navy has ensured compliance with the CZMA through coordination with the ADNR and the submission of a *de minimis* determination under 15 C.F.R. § 930.33(a)(3)(i) on 29 July 2010. This was based on the Navy's determination that the activities analyzed under this EIS were expected to have only insignificant direct or indirect (secondary and cumulative) coastal effects. ADNR concurred with the *de minimis* determination on 14 October 2010.

1.5.6 Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) of 1972 established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The act further regulates "takes" of marine mammals in the global commons (that is, the high seas) by vessels or persons under U.S. jurisdiction. The term "take," as defined in Section 3 (16 U.S.C. 1362) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment, Level A (potential injury) and Level B (potential disturbance).

The National Defense Authorization Act of Fiscal Year 2004 (Public Law 108-136) amended the definition of harassment as applied to military readiness activities or scientific research activities conducted by or on behalf of the federal government, consistent with Section 104(c)(3) [16 U.S.C. 1374 (c)(3)]. The Fiscal Year 2004 National Defense Authorization Act adopted the definition of "military readiness activity" as set forth in the Fiscal Year 2003 National Defense Authorization Act (Public Law 107-314). Military training activities within the TMAA constitute military readiness activities as that term is defined in Public Law 107-314 because training activities constitute "training and operations of the Armed Forces that relate to combat" and constitute "adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use."

For military readiness activities, the relevant definition of harassment is any act that:

- Injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild ("Level A harassment").
- Disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered ("Level B harassment") [16 U.S.C. 1362 (18)(B)(i)(ii)].

16 U.S.C. § 1371(a)(5) directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals by U.S. citizens who engage in a specified activity (exclusive of commercial fishing), if certain findings are made and regulations are issued. Permission will be granted by the Secretary for the incidental take of marine mammals if the taking will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses.

In support of the Proposed Action, the Navy requested a Letter of Authorization (LOA) pursuant to Section 101(a)(5)(A) of the MMPA. The application was reviewed by NMFS and a Notice of Receipt of Application was published in the *Federal Register* on February 3, 2010 (75 FR 5575). Publication of the Notice of Receipt of Application initiated the 30-day public comment period, during which time anyone could obtain a copy of the application by contacting NMFS. In addition, the MMPA requires NMFS to develop regulations governing the issuance of a LOA and to publish these regulations in the *Federal Register*. Subsequently, NMFS published its Proposed Rule in the *Federal Register* on October 19th, 2010 (74 FR 32828). After receiving public comments on the Proposed Rule, NMFS will publish its Final Rule. Several species of marine mammals occur in the TMAA. Accordingly, the Navy has initiated the MMPA compliance process with NMFS, by submission of a request for a LOA. The Navy will receive a LOA from NMFS to permit takes as appropriate.

1.5.7 Endangered Species Act

The Endangered Species Act (ESA) of 1973 established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. An "endangered" species is a species that is in danger of extinction throughout all or a significant portion of its range, while a "threatened" species is one that is likely to become endangered within the foreseeable future throughout all or in a significant portion of its range. The USFWS and NMFS jointly administer the ESA and are also responsible for the listing of species (designating a species as either threatened or endangered). The USFWS has primary management responsibility for management of terrestrial and freshwater species, while the NMFS has primary responsibility for marine species and anadromous fish species (species that migrate from saltwater to freshwater to spawn). The ESA allows the designation of geographic areas as critical habitat for threatened or endangered species.

The ESA provides a program for the conservation of threatened and endangered plants and animals and the habitats in which they are found. The law requires federal agencies, in consultation with the USFWS and/or NMFS, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of designated critical habitat of such species. Under Section 7 of the ESA, "jeopardize" means to engage in any action that would be expected to reduce appreciably the likelihood of the survival and recovery of a listed species by reducing its reproduction, numbers, or distribution.

Regulations implementing the ESA expand the consultation requirement to include those actions that "may affect" a listed species or adversely modify critical habitat. If an agency's proposed action would take a listed species, the agency must obtain an incidental take statement from the responsible wildlife

agency. Consultation is complete once NMFS prepares a final Biological Opinion (BO) and issues an incidental take statement, if necessary.

Four salmonid species (Chinook, coho, sockeye, and steelhead trout), one sea turtle (leatherback), seven marine mammal species (blue whale, fin whale, humpback whale, North Pacific right whale, sei whale, sperm whale, Steller sea lion) and one bird (short-tailed albatross) that are listed as endangered or threatened under the ESA could potentially occur in the TMAA. Critical habitat for North Pacific right whales and Steller sea lions has been designated under the ESA; however, these areas are outside the action area of the TMAA. Accordingly, the Navy has initiated the ESA Section 7 consultation process with NMFS and USFWS. Informal consultation for listed marine birds has been completed with USFWS with their concurrence letter of March 24, 2010. Consultation for listed marine species, including mammals, turtles, and fish, has been initiated with NMFS. Upon concluding Section 7 consultation, the Navy will adhere to any provisions of the NMFS Biological Opinion (BO).

1.5.8 Other Environmental Requirements Considered

The Navy must comply with a variety of other federal environmental laws, regulations, and EOs. These include (among other applicable laws and regulations):

- Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703-711);
- Rivers and Harbors Act (RHA) (33 U.S.C. §§ 401-426);
- Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 U.S.C. §§ 1801-1891);
- Clean Air Act (CAA) (42 U.S.C. §§ 7401-7671);
- Federal Water Pollution Control Act (Clean Water Act, CWA) (33 U.S.C. §§ 1251-1387);
- National Historic Preservation Act (NHPA) (16 U.S.C. § 470);
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898, 59 Federal Register [FR] 7269 [Feb 16, 1994]);
- EO 13045, Environmental Health and Safety Risks to Children (EO 13045, 62 FR 19885 [Apr 23, 1997]);
- Alaska Native Claims Settlement Act of 1971 (ANCSA) (43 U.S.C. §§ 1601-1629); and
- Alaska National Interest Lands Conservation Act (ANILCA) (16 U.S.C. §§ 3101-3233).

In addition, laws and regulations of the State of Alaska appropriate to Navy actions are identified and addressed in this EIS/OEIS. This EIS/OEIS will facilitate compliance with applicable, appropriate state laws and regulations.

1.6 Related Environmental Documents Incorporated by Reference

According to CEQ regulations for implementing NEPA, material relevant to an EIS may be incorporated by reference with the intent of reducing the size of the document (40 C.F.R. § 1502.21). Some of the programs and projects in the GOA that have undergone environmental review and documentation to ensure NEPA compliance are identified below and incorporated herein by reference.

- U.S. Department of the Air Force, 1995. Alaska Military Operations Areas Environmental Impact Statement. August 1995.

    - This EIS analyzed periodic major Joint Task Force (JTF[9]) (Army, Air Force, Marine Corps, and Navy) exercises such as COPE THUNDER and NORTHERN EDGE which utilize the three withdrawn military areas and which stage assets and/or personnel at the Army installations as well as at Eielson and Elmendorf Air Force Bases. The EIS evaluated the occurrence of up to six JTF exercises or Major Flying Exercises (MFE) each year, one sometime between February and April, four between May and August, and one between October and November. Each JTF or MFE usually covers 10 to 15 flying days, not exceeding 60 flying days each year. Additionally, each MFE could have up to 100 aircraft and 200 sorties per MFE-day.

    - The military uses examined in the *Military Operations Areas Environmental Impact Statement* correspond to the military activities of aircraft combat maneuvers, electronic combat operations, insertion/extraction, air-to-ground bombing exercises, and personnel recovery included in the Proposed Action addressed in the GOA EIS.

- U.S. Department of the Air Force, 2007. Improvements to Military Training Routes in Alaska Environmental Assessment (EA), Elmendorf AFB, Alaska: 11 AF.

    - The *Improvements to MTRs in Alaska EA* analyzed the environmental effects of modifying the Alaska network of MTRs to address the inefficiencies of existing routes and improve training efficiency. These modifications included modifying eight routes, removing two routes, adding two new routes, and extending two routes to the coast. The EA analyzed the effects of the Proposed Action on climate and topography, vegetation and wildlife, subsistence uses, parks and recreation, airspace, air quality, and noise. No significant impacts were identified by the EA.

    - The numbers and timing of sorties and the aircraft altitudes and speeds examined in the *Improvements to MTRs in Alaska EA* encompass those that would be associated with the military activities of aircraft combat maneuvers, electronic combat operations, insertion/extraction, air-to-ground bombing exercises, and personnel recovery included in the Proposed Action addressed in the GOA EIS.

- U.S Department of the Army, 1999. Alaska Army Lands Withdrawal Renewal Final Legislative Environmental Impact Statement.

    - The *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999) examined the effects of continued withdrawal from public use under the Military Lands Withdrawal Act and the continued military use of the Fort Wainwright Yukon Training Area (formerly the Fort Wainwright Maneuver Area), the Fort Greely West Training Area (formerly the Fort Greely Maneuver Area) and the Fort Greely East Training Area (formerly the Fort Greely Air Drop Zone). These areas together cover approximately 871,500 acres (352,684 hectares) in interior Alaska.

[9] These JTF exercises are not "certification for deployment" exercises as conducted by Naval Forces in other Range Complexes

- The EIS examined military aircraft air-to-ground training in restricted airspaces R2202 and R2205 over Fort Greely West Training Area and Fort Wainwright Yukon Training Area, respectively. It also analyzed periodic major JTF (Army, Air Force, Marine Corps, and Navy) exercises such as COPE THUNDER and NORTHERN EDGE which utilize the three withdrawn military areas and which stage assets and/or personnel at the Army installations as well as at Eielson and Elmendorf Air Force Bases. The EIS evaluated the occurrence of up to six JTF exercises or Major Flying Exercises (MFE) each year, one sometime between February and April, four between May and August, and one between October and November. Each JTF or MFE usually covered 10 to 15 flying days, but not exceeding 60 flying days each year.

- The EIS also assessed Air Force and joint forces uses of Fort Wainwright and Fort Greely areas for military aircraft air-to-ground training in the restricted airspaces R2202 and R2205. The use of mock enemy airfields, targets, manned radar emitters, anti-aircraft threat simulators, and electronic scoring sensors in the areas was examined. Both low altitude and high altitude bombing by most aircraft in the military inventory at the time of the EIS were analyzed. Weaponry training included aircraft machine guns, rockets, bombs, and air-to-ground missiles.

- The military uses examined in the *Alaska Army Lands Withdrawal Final Legislative EIS* correspond to the military activities of aircraft combat maneuvers, electronic combat operations, insertion/extraction, air-to-ground bombing exercises, and personnel recovery included in the Proposed Action addressed in the GOA EIS.

- U.S. Department of the Army, 2004. Transformation of U.S. Army Alaska Final Environmental Impact Statement.

  - The *Transformation of U.S. Army Alaska Final EIS* examined the effects of transforming the Army's Current Force to a Future Force during the next 30 years. This transformation would affect most aspects of the Army's doctrine, training, leader development, organizations, installations, materiel, and Soldiers. As part of this action, the Army transformed the 172nd Infantry Brigade (Separate) at FWA and FRA into a Stryker Brigade Combat Team (SBCT). Transformation to a SBCT included stationing additional Soldiers; acquiring the Stryker vehicle, UASs and other weapon systems; changing training requirements; and constructing facilities.

  - The military uses examined in the *Transformation of U.S. Army Alaska Final EIS* are consistent with the land training elements of the Proposed Action addressed in the GOA EIS, including insertion/extraction and personnel recovery.

2 Description of the Proposed Action and Alternatives

2 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The Navy proposes to implement actions within the Alaska Training Areas (ATA) to:

- Increase training activities from current levels as necessary to support Fleet exercise requirements to include the use of active sonar; and
- Accommodate new training requirements associated with force structure changes and introduction of new weapons and systems to the Fleet.

The No Action Alternative is required by regulations of the Council on Environmental Quality (CEQ) as a baseline against which the impacts of the Proposed Action are compared. In this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) (hereafter referred to as "EIS/OEIS"), the No Action Alternative is represented by baseline training activities at current levels (one joint force exercise occurring over a maximum time period of 14 days during summer months [April through October]).

The Proposed Action would result in selectively focused but critical increases in training to address training shortfalls, as necessary to ensure the ATA supports Navy training and readiness objectives.

Actions to support current, emerging, and future training activities in the ATA will be evaluated in this EIS/OEIS. These actions include:

- Increasing the number of training activities from current levels as necessary to support Fleet exercise requirements (that could last up to 21 days between April and October);
- Conducting training in the Primary Mission Areas (PMARs) including Anti-Air Warfare (AAW), Anti-Surface Warfare (ASUW), Anti-Submarine Warfare (ASW), Naval Special Warfare (NSW), Strike Warfare (STW), and Electronic Combat (EC). Conduct of training may include that necessary for newer systems, instrumentation, and platforms, including the EA-18G Growler aircraft, Guided Missile Submarines (SSGN), P-8 Poseidon Multimission Maritime Aircraft (MMA), Guided Missile Destroyer (DDG) 1000 (Zumwalt Class) destroyer, and several types of Unmanned Aerial Systems (UASs);
- Accommodating training enhancement instrumentation, to include the use of a Portable Undersea Tracking Range (PUTR);
- Conducting an additional Carrier Strike Group (CSG) exercise during the months of April through October which could also last up to 21 days (first CSG exercise being part of the baseline No Action Alternative); and
- Conducting a Sinking Exercise (SINKEX) during each summertime exercise (a maximum of two) in the TMAA.

This chapter includes the following major topical subsections: Section 2.1 describes the components of the ATA, and Sections 2.2 through 2.6 describe the major elements of the Proposed Action and alternatives to the Proposed Action, including the No Action Alternative.

2.1 DESCRIPTION OF THE ALASKA TRAINING AREAS

Military activities in the ATA occur:

- In the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA) to include: the ocean surface; under the ocean surface; and in the air.

- In the inland Special Use Airspace (SUA) areas of the United States (U.S.) Air Force (Air Force) to include: Restricted Airspace; Military Operations Areas (MOAs); and Visual Flight Rules (VFR) Corridors.
- On the training lands of the U.S. Army (Army) to include: Restricted Areas[1]; Fort Richardson; Fort Wainwright; and the Donnelly Training Area.

Figure 2-1 depicts the components of the ATA.

2.1.1 Gulf of Alaska Temporary Maritime Activities Area

The TMAA is a temporary area that is established in conjunction with the Federal Aviation Administration (FAA) for up to 14 days per year to support the Northern Edge exercise. The TMAA is a surface, undersea space and airspace maneuver area within the GOA for ships, submarines, and aircraft to conduct required training activities. As depicted in Figure 2-2, the TMAA is a polygon that roughly resembles a rectangle oriented from northwest to southeast, approximately 300 nautical miles (nm) (555.6 kilometers [km]) in length by 150 nm (277.8 km) in width, located south of Prince William Sound and east of Kodiak Island. With the exception of Cape Cleare on Montague Island located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore.

2.1.1.1 Airspace of the Temporary Maritime Activities Area

The SUA of the TMAA overlies the surface and subsurface training area. This overwater airspace supports the majority of aircraft training activities conducted by Navy and Joint aircraft throughout the Northern Edge exercise. This SUA extends from the ocean surface to 60,000 feet (ft) (18,288 meters [m]) above mean sea level (MSL), and encompasses 42,146 square nautical miles (nm^2) (145,482 square kilometers [km^2]) of airspace. Additionally, the TMAA overlays a majority of Warning Area (W-612), located over Blying Sound, towards the northwestern quadrant of the TMAA. A Warning Area is airspace of defined dimensions, extending from 3 nm outward from the coast of the United States, which contains activity that may be hazardous to nonparticipating aircraft. The purpose of such Warning Areas is to warn nonparticipating pilots of the potential danger. A Warning Area may be located over domestic or international waters, or both. When not included as part of the TMAA, W-612, which provides 2,256 nm^2 (8,766 km^2) of SUA, is used by the Air Force to conduct training in Anti-Air Warfare (AAW) and by the United States Coast Guard (USCG) to fulfill some of its training requirements. Air Force and USCG activities conducted as part of joint training within the TMAA are included in this EIS/OEIS analysis. No Navy training activities analyzed in this document will occur in the area of W-612 that is outside of the TMAA (Figure 2-1).

2.1.1.2 Sea Space of the Temporary Maritime Activities Area

The TMAA surface area is depicted in Figure 2-2. Total surface area of the TMAA is 42,146 nm^2 (145,482 km^2). While the sea space is ample for training, no permanent infrastructure is in place to support training (i.e., no dedicated training frequencies for communications, instrumentation for tracking and replaying of training activities, Meteorological and Oceanographic Operations [METOC] systems, or target systems). In this region of the Pacific Ocean, storms and high sea states can create challenges for

[1] Restricted Areas: An area or volume of airspace in which the local controlling authorities have determined that air traffic must be restricted (if not continually prohibited) for safety or security concerns. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles.

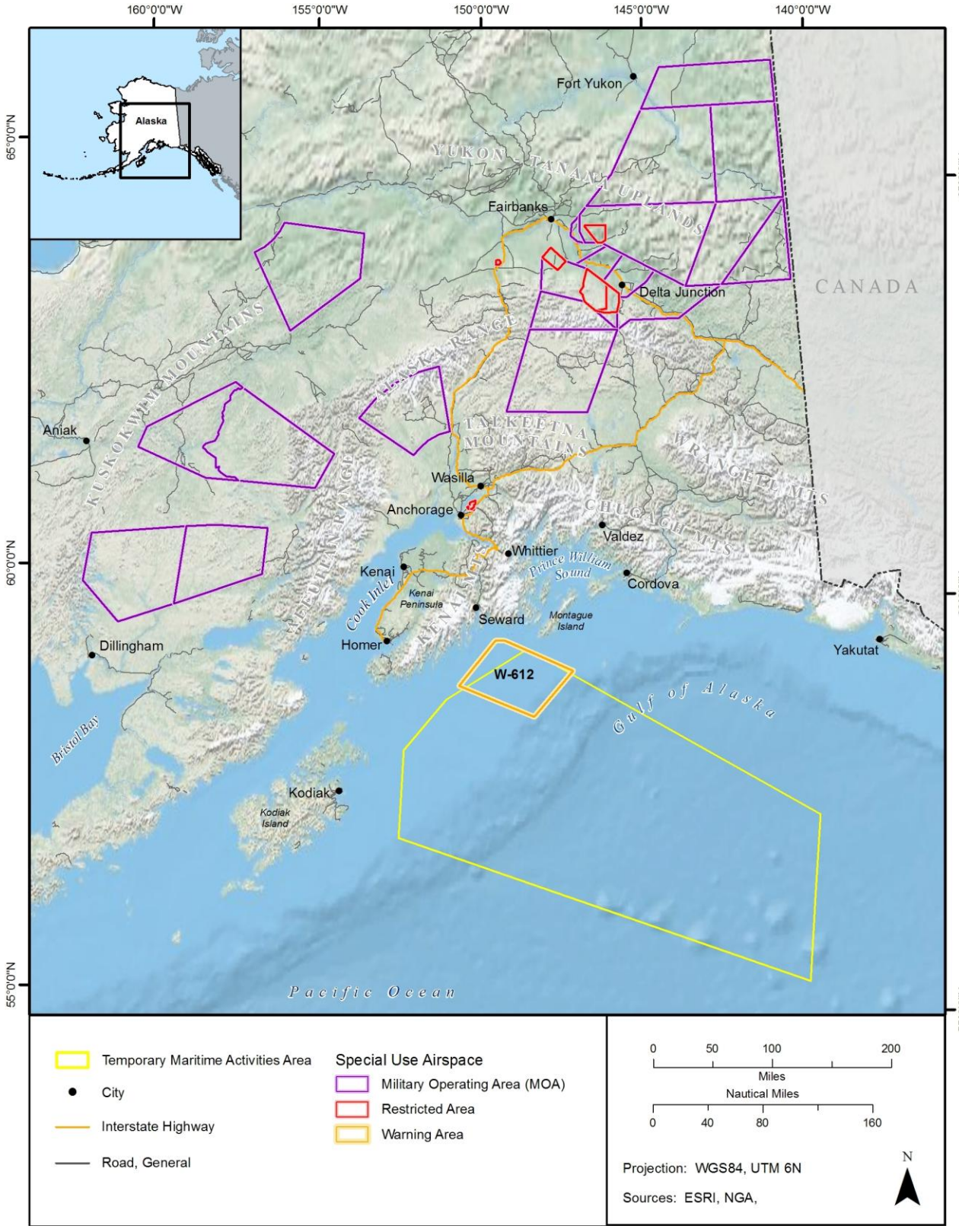


Figure 2-1: Alaska Training Areas

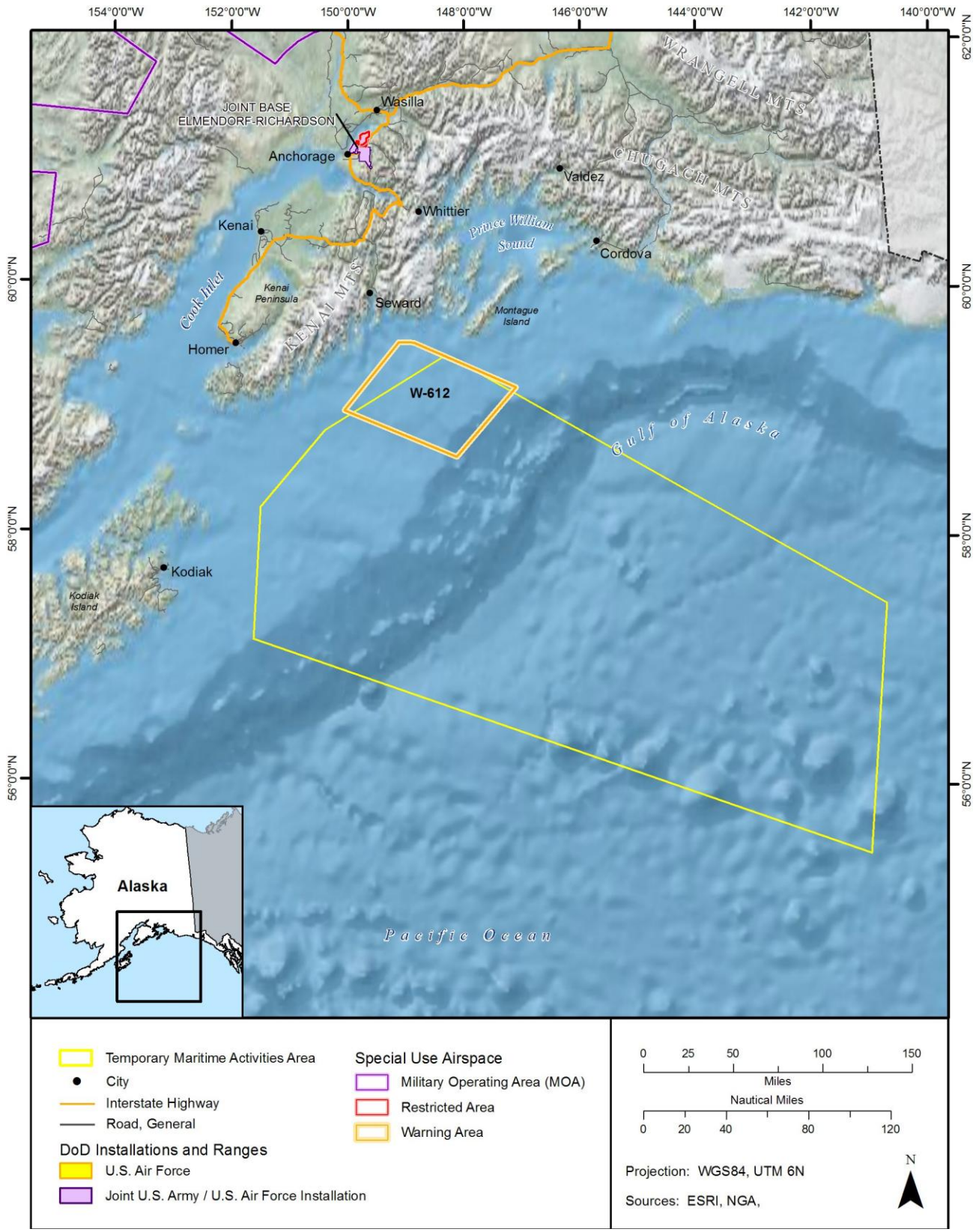


Figure 2-2: Gulf of Alaska Temporary Maritime Activities Area

surface ship training between November and March. In part as a result of these conditions, annual joint training activities are typically conducted during the summer months (April to October).

2.1.1.3 Undersea Space of Temporary Maritime Activities Area

The TMAA undersea area lies beneath the surface area, as described above and depicted in Figure 2-2. Commander Submarine Force, U.S. Pacific Fleet[2] (COMSUBPAC) manages this underwater space as transit lanes and operational areas for U.S. submarines. The undersea area extends to the seafloor. Although ASW activities are not currently conducted, the TMAA undersea operating area is mentioned here because ASW activities, to include the use of active sonar, are part of the Proposed Action.

Table 2-1 summarizes the air, sea, and undersea space of the TMAA and Figure 2-2 depicts the TMAA.

2.1.2 The Inland Special Use Airspace Training Areas of the United States Air Force

The Air Force has a vast network of SUA to conduct flight operations (Figures 2-3 and 2-4). During joint training activities, these inland SUAs are used by the Navy and joint aircraft to conduct AAW and Air-to-Ground integrated Strike Warfare (STW) training activities. In total, the Air Force has over 46,585 nm^2 (159,782 km^2/61,692 square miles [mi^2]) of SUA, of which 43,963 nm^2 (150,789 km^2/58,220 mi^2) are instrumented. The Air Force's SUAs include Restricted Areas (RAs), Military Operations Areas (MOAs), and Visual Flight Rules (VFR) corridors.

RAs are SUAs within which the flight of aircraft, while not wholly prohibited, is subject to restrictions. Activities within these areas must be confined because of their nature or limitations imposed upon aircraft operations that are not a part of those activities or both. Restricted areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, aerial gunnery, or guided missiles. The Army RAs include:

- Oklahoma (R-2202A/B/C) air-to-ground weapons range
- Stuart Creek (R-2205) air-to-ground weapons range
- Blair Lake (R-2211) air-to-ground weapons range
- Fort Richardson (R-2203A/B/C)

Table 2-1: Air, Sea, and Undersea Areas of the Temporary Maritime Activities Area

Area Name	Airspace (nm^2)	Sea Space (nm^2)	Undersea Space (nm^2)
TMAA	42,146	42,146	42,146
W-612	2,256	2,256	2,256

[2] The Commander Submarine Force, U.S. Pacific Fleet is the principal advisor to the Commander, U.S. Pacific Fleet for submarine matters. The force provides anti-submarine warfare, anti-surface ship warfare, precision land strike, mine warfare, intelligence, surveillance, and early warning and special warfare capabilities to the U.S. Pacific Fleet and strategic deterrence capabilities to the U.S. Strategic Command.

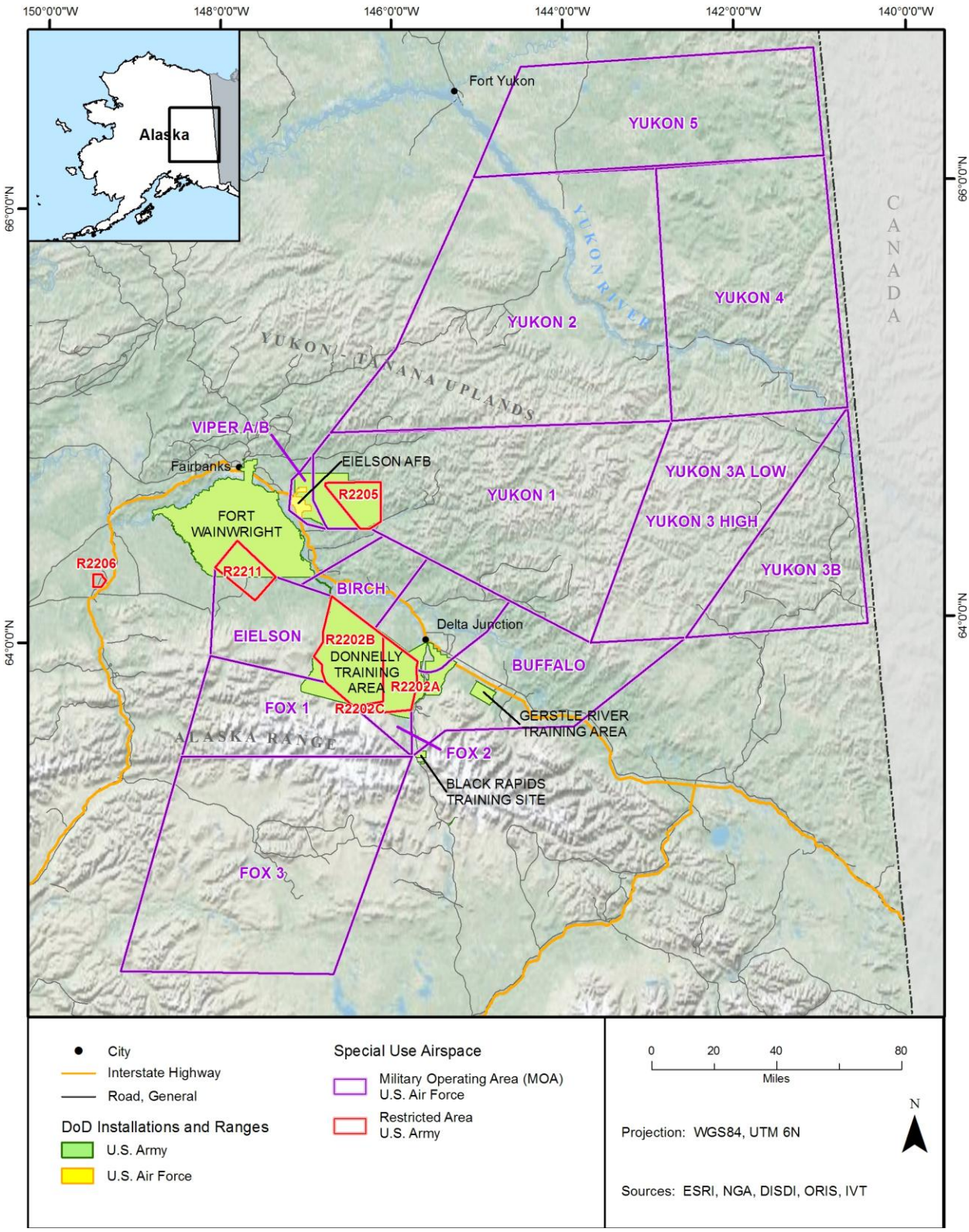


Figure 2-3: Inland Air Ranges and Training Lands of the United States Air Force and Army

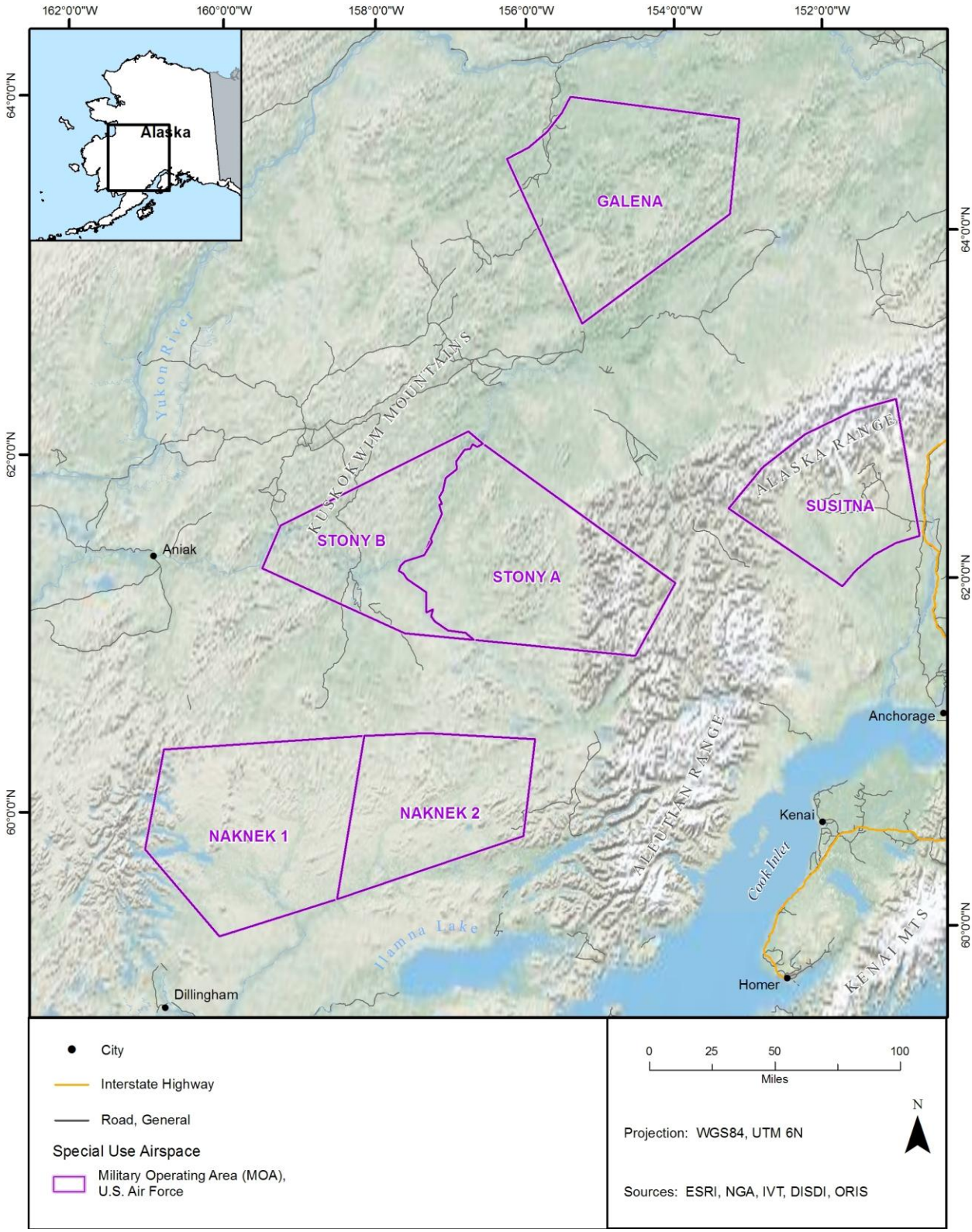


Figure 2-4: Inland Air Ranges of the United States Air Force

MOAs are SUA of defined vertical and lateral dimensions established outside of Class A airspace to separate certain nonhazardous military activities from Instrument Flight Rules (IFR) traffic in controlled airspace and to identify for VFR traffic where these activities are conducted. The Air Force MOAs include:

- Eielson
- Fox 1, 2, 3
- Falcon
- Birch
- Buffalo
- Viper A & B
- Yukon: 1, 2, 3 High, 3A Low, 3B Low, 4, 5, and 6
- Stony A and B, Galena, Susitna, Naknek 1 and 2

VFR corridors are airspace of defined vertical and lateral dimensions that permit general aviation aircraft operating on VFR flight plans to pass through a controlled airspace that would normally require an aircraft to be on an IFR flight plan. These corridors are designed to allow sightseeing of structures of interest that lie within MOA airspace, or allow general aviation aircraft to travel from airport to airport, below or through the MOA, with provided separation from military aircraft. They are typically very specific in regards to altitudes, headings, and speeds to be flown and communications to be made. The Air Force VFR corridors include:

- Richardson Highway
- Alaska Highway
- Birch

The specifics of each SUA are detailed in the Alaska MOAs EIS (USAF 1995). Although Navy AAW and STW activities occurring in Air Force SUAs are discussed in this GOA EIS/OEIS, these activities were analyzed under separate National Environmental Policy Act (NEPA) analysis by the Air Force (Alaska MOAs EIS [USAF, 1995]) for which a Record of Decision (ROD) was issued by the Air Force (USAF 1997). These documents are incorporated by reference, which, in NEPA terms means that the environmental effects of these activities are addressed in these documents. Therefore, further effects analysis of Navy training activities in Air Force airspace in this document is not required. Figures 2-3 and 2-4 depict the Inland Air Ranges of the Air Force.

2.1.3 The Training Lands of the United States Army

The Army training lands used in conjunction with the Proposed Action (Figures 2-3 and 2-5) are robust (roughly 1.3 times the size of the state of Delaware), and provide Navy and Air Force aircraft with the capability to drop live and inert weapons on instrumented ranges in large, complex flying evolutions. In addition to STW activities, the Navy can conduct other ground activities, such as Naval Special Warfare (NSW) and Personnel Recovery (PR) on Army training lands. In total, the Army has over 2,624 mi^2 (6,796 km^2) of training area, of which 1,106 mi^2 (2,866 km^2) are designated as restricted for air-to-ground ordnance. The Army's training lands include:

- Restricted Areas:
    - Donnelly Training Area (R-2202)

  - Yukon Training Area (R-2205)
  - Blair Lake Training Range (R-2211)
- Fort Richardson
- Fort Wainwright

The specifics of each land range are detailed in the Army's *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (1999) and the *Transformation of U.S. Army Alaska FEIS* (Army 2004). Although Navy STW, NSW, and PR activities occurring on Army training lands are discussed in this GOA EIS/OEIS, these activities were analyzed under separate environmental NEPA analysis by the *Army Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (1999) and the *Transformation of U.S. Army Alaska FEIS* (Army 2004). Congress passed the National Defense Authorization Act (P.L. 106-65 2000) for the *Army Lands Withdrawal EIS* in 2000, which approved the Army's withdrawal of lands. Similar to the Air Force documents, these documents are incorporated by reference. Therefore, further environmental effects analysis of Navy activities on Army training lands in this document is not required. Figures 2-3 and 2-5 depict the training lands of the Army.

2.2 NAVY SONAR SYSTEMS

Navy sonar training is a significant component of overall Navy training. Recently, sonar and its potential impacts to the marine environment have become a controversial issue. This section is designed to better inform the reader about a) What is sonar; b) Why the Navy trains with sonar; and c) What sonar is used in the TMAA? The analysis of impacts of sonar to the marine environment is conducted in Chapter 3 of this EIS/OEIS.

2.2.1 What is Sonar?

Sonar, which stands for "**SO**und **N**avigation **A**nd **R**anging," is a tool that uses underwater acoustics to navigate, communicate, or detect other underwater objects. There are two basic types of sonar: active and passive.

- **Active sonar** emits pulses of sound waves that travel through the water, reflect off objects, and return to the receiver on the ship or other sonar sources. By knowing the speed of sound in water and the time for the sound wave to travel to the target and back, a sonar operator can quickly calculate distance between the ship and the underwater object. For example, active sonar systems can be used to track targets and realign internal navigation systems by identifying known ocean floor features. Whales, dolphins, and bats use the same technique, echolocation, for identifying their surroundings and locating prey.
- **Passive sonar** is a listening device that uses hydrophones (underwater microphones) that receive, amplify, and process underwater sounds. Passive sonar is used primarily to detect the presence of submarines. The advantage of passive sonar is that it places no sound in the water, and thus does not reveal the location of the listening vessel. Passive sonar can indicate the presence, character, and direction of submarines.

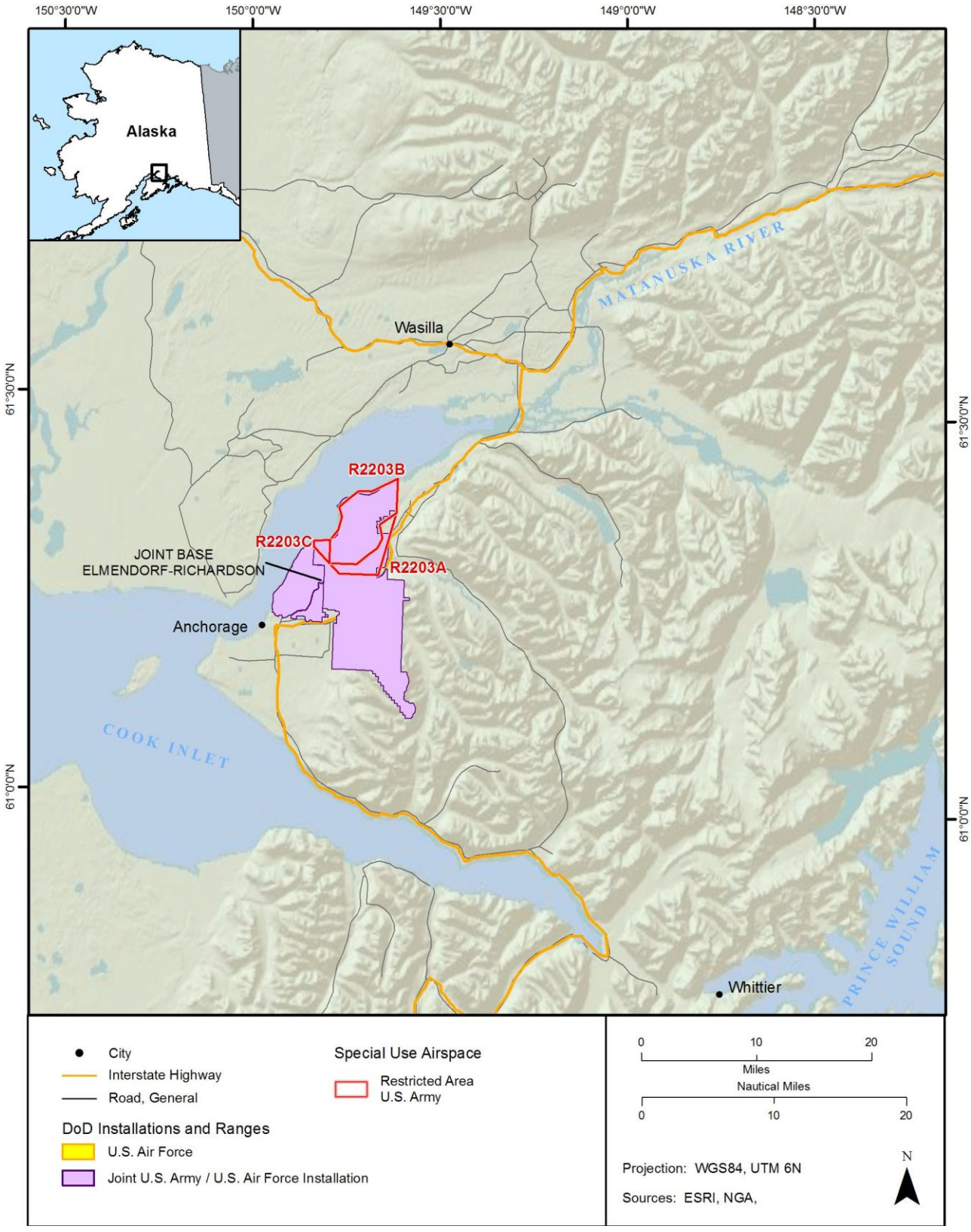
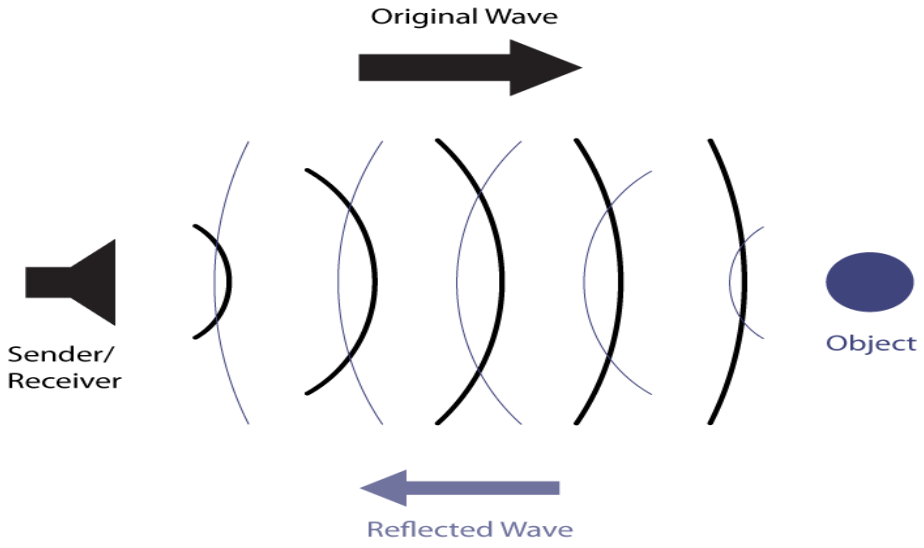


Figure 2-5: Training Lands of the United States Army

Underwater sounds in general, and sonar specifically, can be categorized by their frequency. For the analysis in this EIS/OEIS, sonar falls into one of three frequency ranges: low-frequency, mid-frequency, and high-frequency.

- **Low-frequency** sonar is sonar that emits sounds in the lower frequency range, less than 1 kilohertz (kHz). Low-frequency sonar is useful for detecting objects at great distances, as low-frequency sound does not dissipate as rapidly as higher frequency sounds. However, lower frequency sonar provides less accuracy than other sonars. There are only two ships in use by the U.S. Navy that are equipped with low-frequency sonar: both are ocean surveillance vessels operated by Military Sealift Command. While the Surveillance Towed-Array Sensor System (SURTASS) low-frequency active sonar was analyzed in a separate EIS/OEIS, the proposed action does not include the integration of LFA into the alternatives considered in this EIS/OEIS.
- **Mid-frequency** sonar uses sound in the frequency spectrum between 1 kHz and 10 kHz. With a typical range of up to 10 nm, mid-frequency sonar is the Navy's primary tool for detecting and identifying submarines. Sonar in this frequency range provides a valuable combination of range and target resolution (accuracy).
- **High-frequency** sonar uses frequencies greater than 10 kHz. Although high-frequency sonar dissipates rapidly, giving it a shorter effective range, it provides higher resolution and is useful at detecting and identifying smaller objects such as sea mines.

Modern sonar technology includes a multitude of sonar sensor and processing systems. In concept, the simplest active sonar emits sound waves, or "pings," sent out in multiple directions (i.e., is omnidirectional). Sound waves reflect off the target object and move in multiple directions (Figure 2-6). The time it takes for some of these sound waves to return to the sonar source is calculated to provide a variety of information, including the distance to the target object. More sophisticated active sonars emit an omnidirectional ping and then rapidly scan a steered receiving beam to provide directional as well as range information. Even more advanced sonars use multiple pre-formed beams to listen to echoes from several directions simultaneously and provide efficient detection of both direction and range. For more information about sonar or sound in the sea, go to www.dosits.org.



Source: ManTech-SRS, 2008

Figure 2-6: Principle of an Active Sonar

2.2.2 Why the Navy Trains with Sonar

Sea control is the foundation for the United States' global power projection. If the United States cannot command the seas and airspace above them, it cannot project power to command or influence events ashore and it cannot shape the security environment. For the last century, submarines have been the weapon of choice for countries intending on contesting another nation's control of the seas. Today, the proliferation of advanced, stealthy, nuclear and non-nuclear submarines, equipped with anti-ship weapons of increasing range and lethality, challenge the Navy's ability to guarantee the access and safety of joint forces. Effective ASW remains a remarkably and increasingly complex, high-risk warfare area that will require continued investment in research and development to counter the capabilities of current and future adversaries. The key to maintaining the Navy's ability to defend against adversary submarines is a comprehensive "at-sea" training regime to prepare our Sailors for this contingency. This training requires the use of active sonar. The skills developed during this training are perishable and require periodic refreshing, which can't be regenerated easily. If training is not as realistic as possible, the Navy will quickly lose its edge in this critical dimension of the battlefield.

Submarines have been and are likely to remain the weapon system with the highest leverage in the maritime domain. The ability to locate and track a submarine is a mission skill that must be possessed by every ASW-capable ship, submarine, and aircraft.

There are three fundamental truths about ASW. First, it is critically important to U.S. Navy strategies of sea control, power projection, and direct support to land campaigns.

Second, ASW requires a highly competent team of air, surface, and subsurface platforms to be effective in a complex and a highly variable three-dimensional environment. Each asset has unique strengths that contribute to the full spectrum of undersea, surface, airborne, and space-based ASW systems. The undersea environment – ranging from the shallows of the littoral to the vast depths of the great ocean basins and polar regions under ice – demand a multidisciplinary approach: reliable intelligence; oceanography; and surveillance and cueing of multiple sensors, platforms, and undersea weapons. Most importantly, it takes highly skilled and motivated people.

Finally, as modern submarines have become significantly quieter, passive sonar is not effective enough in tracking and prosecuting all enemy submarines. Active sonar systems, particularly medium frequency active (MFA) sonar, are key enablers of our ability to conduct effective ASW. MFA sonar is the Navy's most effective tool for locating and tracking submarines at distances that preclude effective attack on our ships. The Navy must conduct extensive integrated training, to include the use of active sonar, which mirrors the intricate operating environment present in hostile waters, particularly the littorals. This is of the highest importance to our national security and the safety of our Sailors and Marines

2.3 PROPOSED ACTION AND ALTERNATIVES

2.3.1 Alternatives Development

NEPA implementing regulations provide guidance on the consideration of alternatives in an EIS/OEIS. These regulations require the decision maker to consider the environmental effects of the Proposed Action and a range of alternatives to the Proposed Action (40 Code of Federal Regulations [C.F.R.] § 1502.14). The range of alternatives includes reasonable alternatives, which must be rigorously and objectively explored, as well as other alternatives that are eliminated from further consideration and from further detailed study. To be "reasonable," an alternative must meet the stated purpose of and need for the Proposed Action.

In addition to being required by 40 C.F.R § 1502.14(d), the No Action Alternative in environmental impact analyses is included to ensure that agencies compare the potential impacts of the proposed federal action to the known impacts of maintaining the status quo.

The No Action Alternative currently exists in the EIS/OEIS as a baseline, where the action presented represents a regular and historic level of activity in the ATA to support this type of training and exercises. In other words, the EIS/OEIS's baseline, or No Action Alternative, represents no change from current levels of training usage. The potential impacts of the current level of training activities in the ATA (defined by the No Action Alternative) are compared to the potential impacts of activities proposed under Alternative 1 and Alternative 2.

The Navy solicited input on the alternatives during public scoping meetings, and discussions with regulators and Alaska Native Tribes. Subsequently, alternatives considered in this EIS/OEIS were developed by the Navy after careful assessment by subject-matter experts, including units and commands that use the ATA, range management professionals, and Navy environmental managers and scientists.

The Navy has developed a set of criteria to use in assessing whether a possible alternative meets the purpose of and need for the Proposed Action. Each of these criteria assumes implementation of mitigation measures for the protection of natural resources, as appropriate. Any alternative considered for future analysis should support or employ the following:

1. Appropriate physical environment, including unique and complex bathymetric and oceanographic conditions. These attributes combine to provide a challenging environment for Navy forces to conduct ASW training.
    - Existence of a continental shelf, submarine canyons, and seamounts in the area;
    - Fresh water inputs into the GOA from multiple sources; and
    - Unique areas of upwelling and currents.
2. Proximity of Alaska land and sea training areas to each other to accommodate the joint training mission. The location of the TMAA is directly related to the location of permanent land and air training ranges in Alaska, and supports the mission requirement of Alaskan Command (ALCOM) to conduct joint training for Alaska-based forces and the following elements:
    - Ability to support ALCOM simulated combat conditions, and activities;
    - Infrastructure that supports a robust opposition force, which allows realistic training;
    - Land based infrastructure to support safety of naval aviation including air fields for aircraft emergency diverted landings; and
    - Facilitation of Joint Task Force training in support of PACOM.
3. Availability of sufficiently sized airspace and ranges that support tactically realistic joint training activities. This criterion allows for:
    - Fewer restrictions on supersonic flights;
    - Ability to conduct numerous types of training activities at the same time in relative proximity without compromising safety and training objectives;
    - Continuous, nonsegmented training, from launch to recovery; and
    - Support of the full spectrum of joint, allied, and coalition training.

4. Appropriate weather conditions for a cold-water environment (water temperature between 50 and 60 degrees Fahrenheit [10-15.5 degrees Celsius]) (DoN 2004) suitable for maritime activities at sea, including a sea state of three or less on the Beaufort scale (defined as a moderate sea; average wave height is 2-4 ft [0.6-1.2 m]).
5. Minimal encroachments on joint training requirements that could include, but are not limited to:
    - Low interference in the electronic spectrum to allow for unrestricted use of electronic sensors and systems; and
    - Large areas with sparse populations or low to no permanent human populations.
6. Training sustainment in support of the DoD Title 10 mandate.
7. Proximity to shipping lanes for realistic training on avoiding conflicts with air and marine traffic.

NEPA regulations require that the federal action proponent study means to mitigate adverse environmental impacts of the Proposed Action or an alternative (40 C.F.R. § 1502.16). Additionally, an EIS is to include study of appropriate mitigation measures not already included in the Proposed Action or alternatives (40 C.F.R. § 1502.14(f)). Each of the alternatives considered in this EIS/OEIS includes mitigation measures intended to reduce the environmental effects of Navy activities. Mitigation measures, such as Standard Operating Procedures (SOPs), are discussed throughout this EIS/OEIS in connection with affected resources, and are also addressed in Chapter 5.

2.3.2 Alternatives Eliminated from Further Consideration

Having identified criteria for generating alternatives for consideration in this EIS/OEIS (see Section 2.3.1), the Navy eliminated several alternatives from further consideration pursuant to 40 C.F.R. § 1502.14(a). Specifically, the alternatives described in Sections 2.3.2.1 through 2.3.2.4 were not considered further because, after careful consideration of each in light of the identified criteria and the purpose and need, the Navy determined that none of the eliminated alternatives meet the Navy's purpose of and need for the Proposed Action and satisfy all of the above listed selection criteria.

2.3.2.1 Alternative Locations

An alternate location for Navy training in the ATA that meets the purpose of and need for the Proposed Action does not exist. The proposed locale in the ATA is based on the mission of ALCOM to support the needs of military forces within Alaska and forces deploying through Alaska. ALCOM integrates military activities within Alaska to maximize the readiness of theater forces from and through Alaska in support of worldwide contingencies. The proposed locale encompasses existing training areas with unique sizes and capabilities, and training areas that have the continuity and capability to support Joint training purposes.

The ATA provides a venue in which a large Air Force contingent of aircraft can train jointly with and around a complete Navy Carrier Strike Group (CSG), comprised of an aircraft carrier and several other combatant surface ships. When the Navy conducts Joint training with Air Force assets, the training is often limited to Navy and Air Force aircraft conducting air training on Navy or Air Force ranges. In some cases, Air Force aircraft train with CSGs in other Pacific ranges; however, the size and mix of Air Force forces are significantly limited by the availability of local Air Force assets or by the cost of transporting and sustaining the aircraft and crews for the duration of an exercise. More importantly, very few airfields could meet the parking requirements of the large number of Air Force aircraft that would be involved in a robust Joint training exercise.

However, the Navy's CSG is mobile and capable of carrying out sustained operations over a long period of time. Having Navy forces transit to the TMAA for training not only adds realism, but is economically

prudent. When operating in the TMAA, CSG aircraft can reach established Air Force and Army instrumented ranges in which they can conduct air-to-ground and air-to-air training. Likewise, Alaska-based Air Force aircraft can reach the TMAA without refueling to conduct training with the CSG.

Navy training in the ATA is not limited to air-to-air and air-to-ground training. The unique and complex bathymetric and oceanographic environment in the TMAA presents a challenging ASW training opportunity. The complexity of the sea bottom, the input of freshwater into the sea, and the areas of upwelling and ocean currents combine in the TMAA like in no other training area in the Pacific Ocean. Numerous air, surface, and subsurface assets within a CSG would gain valuable experience conducting ASW training in this environment. For these reasons, alternative sites do not meet the purpose of and need for the Proposed Action and, therefore, were eliminated from further study and analysis.

2.3.2.2 Reduced Training

The Navy's requirements for training have been developed through many years of iteration to ensure Sailors and Marines achieve levels of readiness to ensure they are prepared to properly respond to the many contingencies that may occur during an actual mission. These training requirements are designed to provide the experience and proficiency needed to ensure Sailors are properly prepared for operational success. The Navy has identified training requirements to acquire war fighting proficiency. There is no "extra" training built into the Navy training program. Any reduction of training would not allow the Navy to achieve the levels of certification, proficiency and readiness required to accomplish assigned missions. For this reason, alternatives that would reduce training would not meet the purpose and need of the proposal, and therefore were eliminated from further study and analysis.

2.3.2.3 Alternate Time Frame

An alternate period in which to hold Navy training in the ATA, such as in the winter months, would not be feasible. Weather conditions in the GOA preclude conducting an integrated exercise during the winter. Winter sea conditions, storms, fog, fewer daytime hours, and other environmental conditions would lead to navigational safety concerns for both ships and airplanes involved in any winter exercise. Additionally, other services' training requirements prohibit overwater training when the water temperature decreases below an acceptable level (typical during the winter months in the GOA), as this needlessly jeopardizes the health and safety of exercise participants. Therefore, an alternate time frame would not meet the evaluation factor/screening criterion #4 for maritime activities at sea.

2.3.2.4 Simulated Training

Navy and Marine Corps training already uses computer-simulated training and conducts command and control exercises without operational forces (constructive training) whenever possible. These training methods have substantial value in achieving limited training objectives. Computer technologies provide excellent tools for implementing a successful, integrated training program while reducing the risk and expense typically associated with live military training. However, virtual and constructive training are an adjunct to, not a substitute for, live training, including live-fire training. Unlike live training, these methods do not provide the requisite level of realism necessary to attain combat readiness, and cannot replicate the high-stress environment encountered during an actual contingency situation.

The Navy and Marine Corps continue to research new ways to provide realistic training through simulation, but there are limits to realism that simulation can presently provide, most notably in dynamic environments involving numerous forces, and where the training environment is too complex to accurately model, such as sound behavior in the ocean. Specifically, one such area that would be particularly adversely affected by simulation is ASW training.

Current simulation technology does not permit ASW training with the degree of fidelity required to maintain proficiency. Basic training of sonar technicians does take place using simulators, but beyond basic levels, simulation is of limited utility. A simulator cannot match the dynamic nature of the environment, either in bathymetry, sound propagation properties, or oceanography. Specifically, coordinated unit level and Strike Group Training activities require multiple crews to interact in a variety of acoustic environments that cannot be simulated. Moreover, it is a training imperative that crews actually use the equipment they will be called upon to operate.

Sonar operators and crews must train regularly and frequently to develop the skills necessary to master the process of identifying underwater threats in the complex subsurface environment. They cannot reliably simulate this training through current computer technology because the actual marine environment is too complex. Sole reliance on simulation would deny Navy Strike Groups the ability to develop battle-ready proficiency in the employment of active sonar in the following specific areas:

- Bottom bounce and other environmental conditions;
- Mutual sonar interference;
- Interplay between ship and submarine target; and
- Interplay between ASW teams in the strike group.

Currently, these factors cannot be adequately simulated to provide the fidelity and level of training necessary to safely and effectively use active sonar. Further, like any perishable skill, employment of active sonar is a skill that must be exercised – in a realistic and integrated manner – in order to maintain proficiency. Eliminating the use of active sonar during the training cycle would cause ASW skills to atrophy, and thus would put U.S. Navy forces at risk during operations.

This alternative—substitution of simulation for live training—fails to meet the purpose of and need for the Proposed Action, and was therefore eliminated from detailed study.

2.3.3 Proposed Action and Alternatives Considered

Three alternatives are analyzed in this EIS/OEIS: 1) The No Action Alternative – current activities (no active sonar); 2) Alternative 1 – increase training activities to include the use of active sonar, and accommodate force structure changes to include new platforms, weapon systems, and training enhancement instrumentation; 3) Alternative 2 – increase training activities to include the use of active sonar, accommodate force structure changes to include new platforms, weapon systems, and training enhancement instrumentation, conduct one additional summertime CSG exercise annually, and conduct a SINKEX during each summertime exercise (a maximum of two annually) in the TMAA. The following sections contain the detailed discussion of alternatives carried forward for analysis in the EIS/OEIS.

2.4 NO ACTION ALTERNATIVE – CURRENT TRAINING ACTIVITIES WITHIN THE ALASKA TRAINING AREAS

The Navy routinely trains in the ATA for national defense purposes. Under the No Action Alternative, training activities (no active sonar) as part of large-scale joint exercises would continue at baseline levels required to execute the joint training exercise requirements (one joint force exercise occurring over an maximum time period of 14 consecutive days during summer months [April through October]). The Navy would not increase training activities above historical levels, but would continue exercises in the ATA, and specifically the TMAA, with one CSG or equivalent forces. Evaluation of the No Action Alternative in this EIS/OEIS provides a baseline for assessing environmental impacts of Alternative 1 and Alternative 2 (Preferred Alternative), as described in the following subsections. Training activities and exercises

currently conducted in the ATA are briefly described below.

Each military training activity described in this EIS/OEIS meets a requirement that can be traced ultimately to requirements from the National Command Authority.[3] Training activities in the ATA stem from large-scale joint exercises, such as Northern Edge, which may involve thousands of participants and span several days. These exercises include basic individual or unit level training events of relatively short duration involving few participants that occur simultaneously with the large-scale joint exercises.

Over the years, the tempo and types of activities have fluctuated within the ATA due to changing requirements, the introduction of new technologies, the dynamic nature of international events, advances in warfighting doctrine and procedures, and force structure changes. Such developments have influenced the frequency, duration, intensity, and location of required training. The factors influencing tempo and types of activities are fluid in nature and will continue to cause fluctuations in training activities within the ATA. Accordingly, training activity data used throughout this EIS/OEIS are a representative baseline for evaluating impacts that may result from the proposed training activities.

2.4.1 Description of Current Training Activities within the Alaska Training Areas

For purposes of analysis, training activity data used in this EIS/OEIS are organized by Navy Primary Mission Areas (PMARs). The Navy currently trains in five PMARs in the TMAA; AAW, ASUW, EC, NSW, and STW. The Navy also conducts STW, EC, and NSW training in the Air Force SUA and Army training lands of the ATA. Although discussed in this document, these inland activities and their impacts are covered under other NEPA documentation by the Air Force and Army (USAF 1995, USAF 2007, Army 1999, and Army [2004] [refer to Sections 2.1.2 and 2.1.3]). In the future, Navy requirements will mandate ASW training activities take place in the TMAA using active sonar. Summary descriptions of current training activities conducted in the TMAA and other components of the ATA are provided in the following subsections. As stated earlier, the No Action Alternative is the baseline of current training area usage, thus allowing a comparative analysis between the current tempo and proposed new uses and accelerated tempo of use.

2.4.1.1 Anti-Air Warfare (AAW) Training

In general, AAW is the PMAR that addresses combat activities by air and surface forces against hostile aircraft. Navy ships contain an array of modern anti-aircraft weapon systems, including naval guns linked to radar-directed fire-control systems, surface-to-air missile systems, and radar-controlled cannon for close-in point defense. Strike/fighter aircraft carry anti-aircraft weapons, including air-to-air missiles and aircraft cannons. AAW training encompasses events and exercises to train ship and aircraft crews in employment of these weapon systems against mock threat aircraft or targets. AAW training includes surface-to-air gunnery, surface-to-air and air-to-air missile exercises and aircraft force-on-force combat maneuvers.

Air Combat Maneuvers (ACM): ACM includes Basic Flight Maneuvers (BFM) where aircraft engage in offensive and defensive maneuvering against each other. During an ACM engagement, no ordnance is fired. These maneuvers typically involve two aircraft; however, based upon the training requirement, ACM exercises may involve over a dozen aircraft. For the purposes of this document, aircraft activities

[3] National Command Authority (NCA) is a term used by the United States military and government to refer to the ultimate lawful source of military orders. The term refers collectively to the President of the United States (as commander-in-chief) and the United States Secretary of Defense.

will be described by the term "sortie." A sortie is defined as a single activity by one aircraft (i.e., one complete flight from takeoff to landing).

ACM activities within the ATA are conducted in the TMAA and the inland SUA of the Air Force. These activities are primarily conducted by F/A-18 aircraft. However, for purposes of this study, ACM includes other aircraft activities conducted routinely in preparation for more advanced training flights such as ACM. These other activities include in-flight refueling, basic familiarization training, and formation flying. Additionally, Air Force F-15s, F-16s, and F/A-22s also conduct ACM in the TMAA. No ordnance is released during these exercises. When conducted in the inland SUA of the Air Force, these activities and their impacts are covered under other NEPA analyses (refer to Sections 2.1.2 and 2.1.3).

Air Defense Exercise (ADEX): ADEX is an exercise to train surface and air assets in coordination and tactics for defense of the strike group or other Naval Forces from airborne threats. The activities occur within the TMAA; however, no ordnance is fired.

Surface to Air Missile Exercise (SAMEX): During a SAMEX, surface ships engage threat missiles and aircraft with missiles with the goal of disabling or destroying the threat. One live or inert missile is expended against a target towed by a commercial air services Lear jet after two or three tracking runs. The exercise lasts about 2 hours. The BQM-74E target drone, sometimes augmented with a Target Drone Unit (TDU), is used as an alternate target for this exercise. The BQM target is a subscale, subsonic, remote controlled ground or air launched target. A parachute deploys at the end of target flight to enable recovery at sea. The Surface to Air Missile (SAM) launched can be a Rolling Airframe Missile if installed on an aircraft carrier; otherwise the SAM used is the NATO Sea Sparrow Missile or the Standard Missile. These activities occur within the TMAA.

Surface-to-Air Gunnery Exercise (GUNEX S-A): During a GUNEX S-A, a ship's gun crews engage threat aircraft or missile targets with their guns with the goal of disabling or destroying the threat. A typical scenario involving a DDG with 5-inch guns and/or a guided missile frigate (FFG) with 76 millimeter (mm) Main Battery Guns would have a threat aircraft or anti-ship missile being simulated by an aircraft towing a target (a cloth banner) toward the ship below 10,000 ft, at a speed between 250 and 500 knots (kts) (463 to 926 kilometers per hour [km/h]). Main battery guns are manned and 5-inch and/or 76mm rounds are fired at the threat with the goal of destroying the threat before it reaches the ship. This is a defensive exercise where about six rounds of 5-inch Variable Timed, Non-Fragmentation (VTNF) ammunition and/or 12 rounds of 76-mm per gun mount are fired at a target towed by a commercial air services Lear jet. The ship(s) will maneuver but will typically operate at 10 to 12 kts (18 to 22 km/h) or less during the exercise. The exercise lasts about 2 hours, which normally includes several nonfiring tracking runs followed by one or more firing runs. The target must maintain an altitude above 500 ft (152.4 m) for safety reasons, and is occasionally not destroyed during the exercise. These activities occur within the TMAA.

A typical scenario involving a DDG or FFG with 20mm Close-in-Weapon System (CIWS) is similar, except the ships involved engage the simulated threat aircraft or missile with the CIWS. CIWS-equipped ships can expend between 900 and 1,400 rounds per mount per firing run, for a total of up to five runs during the typical 2-hour exercise. The actual number of rounds expended during this exercise is dependent on the ship class, the CIWS model installed, and the available ammunition allowance.

There is also a Preventive Maintenance requirement to test fire CIWS prior to this exercise, called a Pre-action calibration firing (PACFIRE). A PACFIRE generally expends about 30 rounds per firing mount.

Air to Air Missile Exercise (AAMEX): During an AAMEX, aircraft attack a simulated threat target aircraft with air-to-air missiles with the goal of destroying the target. Air-to-air missiles (approximately half of

the missiles have live warheads and about half have an inert telemetry package) are fired from aircraft against aerial targets to provide aircrews with experience using aircraft missile firing systems and training on air-to-air combat tactics. Participating air units include fighter and fighter/attack aircraft firing a variety of air-to-air missiles. The main aerial targets are flares for heat-seeking missiles and Tactical Air Launched Decoys (TALDs) for radar-guided missiles. The targets typically are launched by other Navy aircraft that are participating in the exercise. Neither the flares nor TALDs are recovered after use. These activities occur within the TMAA. Similar activities could occur in the Air Force SUAs of the ATA, but their impacts are covered under other NEPA analyses (refer to Sections 2.1.2 and 2.1.3).

A typical scenario would involve a flight of two aircraft operating between 15,000 and 25,000 ft (4,572 and 7,620 m) and at a speed of about 450 kts (834 km/h) that approach a target from several miles away and, when within missile range, launch their missiles against the target. The missiles fired, to include the AIM-7 Sparrow, AIM-9 Sidewinder and AIM-120 AMRAAM, are not recovered. The target is either a TALD or a LUU-2B/B illumination paraflare (an illumination flare that hangs from a parachute). Both the TALDs and the paraflares are expended. These exercises last about one hour, and are conducted in the TMAA outside of 12 nm (22 km) and well above 3,000 ft (914 m).

2.4.1.2 Anti-Surface Warfare (ASUW) Training

In general, ASUW is the PMAR that addresses combat (or interdiction) activities in which aircraft, surface ships, and submarines employ weapons and sensors directed against enemy surface ships or boats. Air-to-surface ASUW is conducted by aircraft assets employing long-range attack maneuvers using precision guided munitions or aircraft cannons. ASUW also is conducted by warships employing naval guns and surface-to-surface missiles. Submarines attack surface ships using submarine-launched, anti-ship cruise missiles. Training in ASUW includes surface-to-surface gunnery and missile exercises, air-to-surface gunnery and missile exercises, and submarine missile launch events. Training generally involves expenditure of ordnance against a towed target. ASUW also encompasses maritime interdiction, that is, the interception of a suspect surface ship by a Navy ship for the purpose of boarding-party inspection or the seizure of the suspect ship.

Visit Board Search and Seizure/Vessels of Interest (VBSS/VOI): VBSS/VOI missions are the principal type of Maritime Interdiction Operations (MIO) used by naval forces. Highly trained teams of armed personnel, wearing body armor, flotation devices, and communications gear are deployed from ships at sea into small Zodiac boats or helicopters to board and inspect ships and vessels suspected of carrying contraband. Once aboard, the team takes control of the bridge, crew, and engineering plant, and inspects the ship's papers and its cargo. VBSS missions are assumed to be nonhostile, but team members are trained and prepared to deal with noncooperation at all levels. When a helicopter is involved, either to provide cover or embark the inspection party, it is considered a Helicopter Visit Board Search and Seizure. These activities occur within the TMAA.

Air-to-Surface Missile Exercise (A-S MISSILEX): A-S MISSILEX involves fixed-winged aircraft and helicopter crews launching missiles at surface maritime targets, day and night, with the goal of training to destroy or disable enemy ships or boats. These activities occur within the TMAA; however all missile launches are be simulated.

For helicopter A-S MISSILEX, one or two MH-60R/S helicopters approach and acquire an at-sea surface target, which is then designated with a laser to guide an AGM-114 Hellfire missile to the target. The laser designator may be onboard the helicopter firing the hellfire, another helicopter, or another source. The helicopter simulates launching a missile from an altitude of about 300 ft against a specially prepared target with an expendable target area on a nonexpendable platform. The platform fitted with the expendable target could be a stationary barge, a remote-controlled speed boat, or a jet ski towing a

trimaran whose infrared signature has been augmented with a heat source (charcoal or propane) to better represent a typical threat vessel. All missile firings would be simulated.

For A-S MISSILEX fired from fixed-wing aircraft, the simulated missile used is typically an AGM-84 Standoff Land Attack Missile-Expanded Response (SLAM-ER), an AGM-84 Harpoon, or an AGM-65 Maverick. A flight of one or two aircraft approach an at-sea surface target from an altitude between 40,000 ft (12,192 m) and 25,000 ft (7,620 m) for SLAM-ER or Harpoon, and between 25,000 ft (7,620 m) and 5,000 ft (1,524 m) for Maverick, complete the internal targeting process, and simulate launching the weapon at the target from beyond 150 nm (278 km) for SLAM-ER and from beyond 12 nm (22 km) for Maverick. The majority of unit level exercises involve the use of captive carry (inert, no release) training missiles; the aircraft perform all detection, tracking, and targeting requirements without actually releasing a missile. These activities occur within the TMAA and all missile launches would be simulated.

Air-to-Surface Bombing Exercise (A-S BOMBEX): During an A-S BOMBEX, maritime patrol aircraft (MPA) or F/A-18 deliver free-fall bombs against surface maritime targets, with the goal of destroying or disabling enemy ships or boats.

A flight of one or two aircraft will approach the target from an altitude of between 15,000 ft (4,570 m) to less than 3,000 ft (914 m) while adhering to designated ingress and egress routes. Typical bomb release altitude is below 3,000 ft (914 m) and within a range of 1,000 yards (yd) (914 m) for unguided munitions, and above 15,000 ft (4,572 m) and in excess of 10 nm (18 km) for precision-guided munitions. Exercises at night will normally be done with captive carry (no drop) weapons because of safety considerations. Laser designators from own aircraft or a support aircraft are used to illuminate certified targets for use with lasers when using laser guided weapons. Bombs used could include BDU-45 (inert) or MK-82/83/84 (live and inert). These activities occur within the TMAA. In the near future, the Navy will be transitioning all carrier based MK-80 series bombs to BLU 110, 111, and 117 live and inert bombs. The difference is that the BLU-series bombs contain insensitive (less likely to accidently explode) high explosives, which make them safer for carrier-based operations. All other attributes would remain the same.

Air-to-Surface Gunnery Exercise (A-S GUNEX): Strike fighter aircraft and helicopter crews, including embarked NSW personnel use guns to attack surface maritime targets, day or night, with the goal of destroying or disabling enemy ships, boats, or floating or near-surface mines.

For fixed-wing A-S GUNEX, a flight of two F/A-18 aircraft will begin a descent to the target from an altitude of about 3,000 ft (914 m) while still several miles away. Within a distance of 4,000 ft (1,219 m) from the target, each aircraft will fire a burst of about 30 rounds before reaching an altitude of 1,000 ft (305 m), then break off and reposition for another strafing run until each aircraft expends its exercise ordnance allowance of about 250 rounds from its 20mm cannon.

For rotary-wing A-S GUNEX, a single helicopter will carry several air crewmen needing gunnery training and fly at an altitude between 50 and 100 ft (15 to 30m) in a 300-ft (91-m) racetrack pattern around an at-sea target. Each gunner will expend about 200 rounds of 0.50 caliber (cal) and 800 rounds of 7.62mm ordnance in each exercise. The target is normally a noninstrumented floating object such as an expendable smoke float, steel drum, or cardboard box, but may be a remote-controlled speed boat or jet ski type target. The exercise lasts about 1 hour and occurs within the TMAA.

Surface-to-Surface Gunnery Exercise (S-S GUNEX): These exercises train surface ship crews in high-speed surface engagement procedures against mobile (towed or self-propelled) seaborne targets. Both live and inert training rounds are used against the targets. The training consists of the pre-attack phase, including locating, identifying, and tracking the threat vessel, and the attack phase in which the guns are

fired at the target. In a live-fire event, aircraft conduct a surveillance flight to ensure that the range is clear of nonparticipating ships.

For S-S GUNEX from a Navy ship, gun crews engage surface targets at sea with their main battery 5-inch and 76mm guns as well as smaller surface targets with 25mm, 0.50-caliber (cal), or 7.62mm machine guns, with the goal of disabling or destroying the threat target.

For S-S GUNEX from a Navy small boat, the weapon used is typically a 0.50-cal, 7.62mm or 40mm machine gun.

The number of rounds fired depends on the weapon used for S-S GUNEX. For 0.50-cal, 7.62mm, or 40mm ordnance, the number of rounds is approximately 200, 800, and 10 rounds respectively. For the ship main battery guns, the gun crews typically fire approximately 60 rounds of 5-inch or 76mm ordnance during one exercise. These activities occur within the TMAA.

Maritime Interdiction (MI): MI is a coordinated defensive preplanned attack against multiple sea-borne and air targets using airborne and surface assets with the objective of delivering a decisive blow to enemy forces. These exercises typically involve all the assets of the CSG and Joint forces in an attempt to neutralize the threat. Weapons firing is simulated, and the exercise occurs exclusively within the TMAA each day.

Sea Surface Control (SSC): SSC exercises involve aircraft, typically FA-18 hornets, performing reconnaissance of the surrounding battlespace. Under the direction of the Sea Combat Commander[4], the airborne assets investigate surface contacts of interest and attempt to identify, via onboard sensors or cameras, the type, course, speed, name, and other pertinent data about the ship of interest. Due to the curvature of the earth, surface assets are limited in their ability to see over the horizon. The airborne assets, due to their speed and altitude, can cover great distances in relatively short periods, and see far beyond the capabilities of the surface ship. This enables them to report contacts that cannot be seen by ships. By using airborne assets, the Sea Combat Commander, in effect, is able to see beyond the horizon and develop a clearer tactical picture well in advance. These activities occur within the TMAA.

2.4.1.3 Electronic Combat (EC) Training

In general, EC is the PMAR that aims to control the use of the electromagnetic spectrum and to deny its use by an adversary. Typical EC activities include threat avoidance training, signals analysis for intelligence purposes, and use of airborne and surface electronic jamming devices to defeat tracking systems.

Electronic Combat (EC): EC exercises are conducted to prevent or reduce the effective use of enemy electronic equipment and ensure the continued use of friendly electronic equipment, including command and control capabilities. During EC training, appropriately configured aircraft fly threat profiles against ships so that the ship's crews are trained to detect electronic signatures of various threat aircraft and counter the jamming of the ship's own electronic equipment by the simulated threat.

Electronic Support (ES) provides the capability to intercept, identify, and locate enemy emitters while Electronic Attack (EA) employs tactics, such as electronic jamming, to prevent or reduce effective use of

[4] The Sea Combat Commander is the individual who has the overall responsibility for defending the CSG against surface threats.

enemy electronic equipment and command and control capability. EA and ES are subsets of EC. Typical EC activities include threat-avoidance training, signals analysis, and use of airborne and surface electronic jamming devices to defeat tracking radar systems. During these exercises, aircraft, surface ships, and submarines attempt to control critical portions of the electromagnetic spectrum used by threat radars, communications equipment, and electronic detection equipment to degrade or deny the enemy's ability to defend its forces from attack and/or recognize an emerging threat early enough to take the necessary defensive actions. These activities occur within the TMAA. Additionally, this activity can occur in and on the Air Force SUA and Army land ranges of ATA. When conducted in the Air Force SUA and Army land ranges, these activities and their impacts are covered under other NEPA analyses (refer to Sections 2.1.2 and 2.1.3).

Chaff Exercise (CHAFFEX): Ships, fixed-winged aircraft, and helicopters deploy chaff to disrupt threat targeting and missile guidance radars and to defend against an attack. The chaff exercise trains aircraft in the use and value of chaff to counter an enemy threat. Radio frequency chaff is an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Chaff is released or dispensed from military vehicles in cartridges or projectiles that contain millions of chaff fibers. Chaff is composed of an aluminum alloy coating on glass fibers of silicon dioxide. These aluminum-coated glass fibers (about 60 percent silica and 40 percent aluminum by weight) range in lengths of 0.8 to 7.5-cm with a diameter of about 40 micrometers. When deployed, a diffuse cloud of fibers undetectable to the human eye is formed. Chaff is a very light material that can remain suspended in air anywhere from 10 minutes to 10 hours. Chaff is employed for a number of different tactical reasons, but the end goal is to create a target from the chaff that will lure enemy radar and weapons system away from the actual friendly platform.

Chaff may be employed offensively, such as before a major strike to "hide" inbound striking aircraft or ships, or defensively in reaction to being detected by an enemy targeting radar. Defensive chaff training is the most common exercise used for training both ships and aircraft. In most cases, the chaff exercise is training for the ship or aircraft that actually deploys the chaff, but it is also a very important event to "see" the effect of the chaff from the "enemy" perspective so that radar system operators may practice corrective procedures to "see through" the chaff jamming, so exercises are often designed to take advantage of both perspectives. These activities occur within the TMAA. Additionally, this activity can occur in and on the Air Force SUA and Army land ranges of ATA. When conducted in the Air Force SUA and Army land ranges, these activities and their impacts are covered under other NEPA analyses (refer to Sections 2.1.2 and 2.1.3).

Counter Targeting: A Counter Targeting exercise is a coordinated, defensive activity utilizing surface and air assets, that attempts to use jamming and chaff to show a false force presentation to inbound surface-to-surface platforms. During these exercises, EA-6B jamming aircraft will position itself between the CSG assets and the threat and jam the radar systems of potential hostile surface units. CSG ships will launch chaff to create false targets that saturate the threat radars return, thus masking their true position. These activities occur within the TMAA.

2.4.1.4 Naval Special Warfare (NSW) Training

In general, NSW forces (Sea, Air, Land [SEALs] and Special Boat Units [SBUs]) train to conduct military activities in five Special Operations mission areas: unconventional warfare, direct action, special reconnaissance, foreign internal defense, and counterterrorism. NSW training involves specialized tactics, techniques, and procedures, employed in training events that could include insertion/extraction activities using parachutes, rubber boats, or helicopters and other equipment.

Insertion/Extraction: Personnel approach or depart an objective area using various transportation methods and covert or overt tactics depending on the tactical situation. These exercises train forces to insert and

extract personnel and equipment day or night. There are a number of different insertion or extraction techniques that are used depending on the mission and tactical situation. NSW personnel conduct insertion/extraction exercises using helicopters and other equipment. These activities take place in existing Air Force SUA and Army training lands. When conducted in the Air Force SUA and Army land ranges, these activities and their impacts are covered under other NEPA analyses (refer to Sections 2.1.2 and 2.1.3).

2.4.1.5 Strike Warfare (STW) Training

In general, Strike Warfare is the PMAR that addresses combat (or interdiction) activities by air and surface forces against hostile land based forces and assets. STW activities include training of fixed-wing fighter/attack aircraft in delivery of precision guided munitions, nonguided munitions, rockets, and other ordnance against land targets in all weather and light conditions. Training events typically involve a strike mission with a flight of four or more aircraft. The strike mission practices attacks on "long-range targets" (i.e., those geographically distant from friendly ground forces), or close air support of targets within close range of friendly ground forces. Laser designators from aircraft or ground personnel may be employed for delivery of precision-guided munitions. Some strike missions involve no-drop events in which prosecution of targets is practiced, but video footage is often obtained by onboard sensors. Strike exercises occur on the land and air training ranges as identified in the Air Force Alaska MOAs EIS, (USAF 1995) and their impacts are covered under its environmental analysis.

Air-to-Ground Bombing Exercise (BOMBEX): Air-to-ground bombing exercises consist of fixed-winged strike fighter aircraft that deliver bombs and rockets against land targets, day or night, with the goal of destroying or disabling enemy vehicles, infrastructure, and personnel. Typically, a flight of two to four aircraft will depart the aircraft carrier and fly inland at high altitude (greater than 30,000 ft [9,144 m]). The flight will approach the inland target from an altitude of between 15,000 ft (4,572 m) to less than 3,000 ft (914 m) and, will usually establish a racetrack pattern around the target. The pattern is established in a predetermined horizontal and vertical position relative to the target to ensure that all participating aircraft follow the same flight path during their target ingress, ordnance delivery, target egress, and "downwind" profiles. This type of pattern is designed to ensure that only one aircraft will be releasing ordnance at any given time. The typical bomb release altitude is below 3,000 ft (914 m) and within a range of 1,000 yards (yd) (914 m) for unguided munitions or above 15,000 ft (4,572 m) and may be in excess of 10 nm (18 km) for precision-guided munitions. Exercises at night will normally be done with captive carry (no drop) weapons because of safety considerations. Laser designators from the aircraft dropping the bomb, a support aircraft, or ground support personnel are used to illuminate certified targets for use with lasers when using laser-guided weapons. The average time for this exercise is about 1 hour. These activities take place in the inland SUA of the Air Force and on the Army land ranges of the ATA, where their impacts are covered under other NEPA analyses (refer to Sections 2.1.2 and 2.1.3).

Personnel Recovery (PR): PR is a strike warfare activity with the purpose of training aircrews to locate, protect, and evacuate downed aviation crew members. In a hostile environment, this exercise becomes a Combat Search and Rescue (CSAR) mission. The activity can include reconnaissance aircraft to find the downed aircrew, helicopters to conduct the rescue, and fighter aircraft to perform close air support to protect both the downed aircrews and the rescue helicopters. These activities can take place throughout the ATA.

2.4.1.6 Other Training

Deck Landing Qualifications (DLQs): This mission provides training for helicopter crews to land on ships underway at sea. Perhaps the most demanding mission of any aviator is landing an aircraft aboard a ship. The mission is made even more difficult when these activities are required at night or in rough sea states. Further compounding the situation during Northern Edge exercises is the fact that aircrew from the Air

Force, Army, and U.S. Coast Guard, who do not normally perform DLQs, use this venue to practice helicopter DLQs onboard naval vessels. For safety, the Navy has strict guidelines and rules on frequency and duration between landings. As this is not a normal activity for Air Force, Army, and USCG helicopter crews, the number and duration of particular DLQs that occur during a joint training exercise can vary dramatically.

DLQ activities take place on an underway Navy or USCG ship. The activities take place in both day and night, and could involve more than one helicopter over a period of several hours. The crew that is receiving the training typically departs from a shore facility and flies out to sea to make an approach and landing aboard the ship. After the required number of landings is completed, the helicopter either remains aboard ship or departs for shore. These activities take place in the TMAA.

2.4.2 Naval Force Structure

The Navy has established policy governing the composition and required mission capabilities of deployable naval units, focused on maintaining flexibility in the organization and training of forces. Central to this policy is the ability of naval forces of any size to operate independently or to merge into a larger naval formation to confront a diverse array of challenges. Thus, individual units may combine to form a Strike Group, and Strike Groups may combine to form a Strike Force. Composition of the Strike Groups and Strike Forces is discussed in Section 2.4.2.1.

2.4.2.1 "Baseline" Naval Force Composition

Navy policy defines the "baseline" composition of deployable naval forces. The baseline is intended as an adaptable structure to be tailored to meet specific requirements. Thus, while the baseline composition of a CSG calls for a specified number of ships, aviation assets, and other forces, a given CSG may include more or fewer units, depending on their mission. The baseline naval force structures established by Navy policy for a CSG are: One Aircraft Carrier; One Carrier Air Wing consisting of four Strike Fighter squadrons, one Electronic Combat squadron, two Combat Helicopter squadrons, and two logistics aircraft; Five Surface Combatant Ships where "Surface Combatant" refers to guided missile cruisers, destroyers, and frigates, and future DDG 1000 and Littoral Combat Ship platforms; one attack submarine; and one logistic support ship.

2.4.2.2 Opposition Force Composition

To support a realistic training scenario, the Navy routinely contracts civilian vessels, such as fishing and recreational vessels, to simulate enemy targets and make up an opposition force. To support exercises in the TMAA, there are approximately nineteen contracted vessels hired to support a typical joint training exercise.

2.5 ALTERNATIVE 1 – INCREASE TRAINING ACTIVITIES TO INCLUDE ANTI-SUBMARINE WARFARE ACTIVITIES AND ACCOMMODATE FORCE STRUCTURE CHANGES

Under Alternative 1, in addition to training activities currently conducted, the ATA would support an increase in training activities designed to meet Navy and DoD current and near-term operational requirements. This increase would encompass conducting one large-scale joint force exercise, including ASW activities and the use of active sonar, occurring over a maximum time period of up to 21 consecutive days during the summer months (April through October). Alternative 1 would include basic individual or unit level training events of relatively short duration occurring simultaneously with the large-scale joint force exercise. Alternative 1 would also accommodate increases in training activities due to force structure changes associated with the introduction of new weapon systems, vessels, aircraft, and training instrumentation into the Fleet. Training activities associated with force structure changes would be implemented for the EA-18G Growler, SSGN, P-8 MMA, DDG 1000 (Zumwalt Class), and UASs.

Force structure changes associated with new weapons systems would include new types of sonobuoys. Force structure changes associated with new training instrumentation include the use of a Portable Undersea Tracking Range (PUTR) (refer to Section 2.5.3.3).

2.5.1 Description of Training Activities and Levels

Table 2-5 identifies the baseline and proposed increases in activities in the ATA if Alternative 1 were to be implemented.

2.5.2 Anti-Submarine Warfare (ASW) Training

ASW Tracking Exercise (TRACKEX) trains aircraft, ship, and submarine crews in tactics, techniques, and procedures for search, detection, localization, and tracking of submarines with the goal of determining a firing solution that could be used to launch a torpedo and destroy the submarine. A typical unit-level exercise involves one (1) ASW unit (aircraft, ship, or submarine) versus one (1) target, usually a MK-39 Expendable Mobile ASW Training Target (EMATT) (Appendix H) or a live submarine. The target may be nonevading while operating on a specified track or fully evasive. Participating units use active and passive sensors, including hull-mounted sonar, towed arrays, dipping sonar, variable depth sonar and sonobuoys for tracking. ASW activities will include the use of active sonar.

Helicopter ASW TRACKEX: A helicopter ASW TRACKEX typically involves one or two MH-60R helicopters using both passive and active sonar for tracking submarine targets. For passive tracking, the MH-60R will deploy patterns of passive sonobuoys that will receive underwater acoustic signals, providing the helicopter crew with locating information on the target. Active sonobuoys may also be used. An active sonobuoy, as in any active sonar system, emits an acoustic pulse that travels through the water, returning echoes if any objects, such as a submarine, are within the range of acoustic detection. For active sonar tracking, the MH-60R crew will rely primarily on its AQS-22 Dipping Sonar. The sonar is lowered into the ocean while the helicopter hovers within 50 ft (15m) of the surface. Similar to the active sonobuoy, the dipping sonar emits acoustic energy and receives any returning echoes, indicating the presence of an underwater object.

The target for this exercise is either an EMATT or live submarine which may be either nonevading and assigned to a specified track or fully evasive depending on the state of training of the helicopter crew. A Helicopter TRACKEX usually takes 2 to 4 hours. No torpedoes are fired during this exercise.

Maritime Patrol Aircraft (MPA)[5] *ASW TRACKEX*: During these exercises, a typical scenario involves a single MPA dropping sonobuoys, from an altitude below 3,000 ft (914 m), into specific patterns designed for both the anticipated threat submarine and the specific water conditions. These patterns vary in size and coverage area based on anticipated threat and water conditions. Typically, passive sonobuoys will be used first, so the threat submarine is not alerted. Active sonobuoys will be used as required either to locate extremely quiet submarines or to further localize and track submarines previously detected by passive buoys (see Section 2.2.1 for a discussion of passive and active sonar). The MPA will typically operate below 3,000 ft (914 m) to drop sonobuoys, will sometimes be as low as 400 ft (122 m), then it may climb to several thousand feet after the buoy pattern is deployed. The higher altitude allows monitoring the buoys over a much larger search pattern area.

[5] MPA currently refers to the P-3C Orion aircraft. The P-8 Multi-Mission Maritime Aircraft is scheduled to replace the P-3C as the Navy's Maritime Patrol Aircraft.

The target for this exercise is either an EMATT or live submarine which may be either nonevading and assigned to a specified track or fully evasive depending on the state of training of the MPA. A TRACKEX-MPA usually takes 2 to 4 hours. No torpedoes are fired during this exercise.

Extended Echo Ranging (EER) ASW Exercises: This exercise is an at-sea flying event designed to train MPA crews in the deployment and use of the EER sonobuoy systems. This system uses the SSQ-110A as the signal source and the SSQ-77 as the receiver buoy. This activity differs from the MPA ASW TRACKEX in that the SSQ-110A sonobuoy uses two explosive charges per buoy for the acoustic source. Other active sonobuoys use an electrically generated "ping."

A typical EER exercise lasts approximately 6 hours. The aircrew will first deploy 16 to 20 SSQ-110A sonobuoys and 16 to 20 passive sonobuoys in 1 hour. For the next 5 hours, the sonobuoy charges will be detonated, while the EER system analyzes the returns for evidence of a submarine. This exercise may or may not include a practice target. In the near future, the Navy will be replacing the EER sonobuoys with the Multi-static Active Coherent (MAC) sonobuoys, which are described in detail in Section 2.5.3.2.

ASW TRACKEX (Surface Ship): Surface ships operating in the TMAA would use hull-mounted active sonar to conduct ASW Tracking exercises. Typically, this exercise would involve the coordinated use of other ASW assets, to include MPA, helicopters, and other ships.

ASW TRACKEX (Submarine): During these exercises submarines use passive sonar sensors to search, detect, classify, localize, and track the threat submarine with the goal of developing a firing solution that could be used to launch a torpedo and destroy the threat submarine. However, no torpedoes are fired during this exercise.

2.5.2.1 Sonars Used in the TMAA

For the purposes of this EIS/OEIS, the term sonar refers to a system, either passive or active, used to locate underwater objects. In addition to those systems commonly referred to as sonar, there are other acoustic sources used or proposed for use by the Navy in the TMAA. For example, the MK-84 tracking pinger and the PUTR uplink transmitter are both sources of underwater sound. Although not technically sonars, they do create sound and are considered in this analysis as acoustic systems. Tables 2-2 and 2-3 list typical U.S. Navy acoustic systems and identify those that may be used during training activities conducted in the TMAA. All sources that may be used in the TMAA were analyzed for potential impacts to the marine environment.

Certain systems, because of their frequent use or high power output, were quantitatively modeled for their acoustic impacts. The acoustic systems presented in Table 2-2 have been quantitatively modeled. Table 2-3 lists the systems that have been analyzed, but not quantitatively modeled. The systems that were not modeled include systems that are typically operated at frequencies greater than 200 kHz. Because it is not used in the TMAA, low-frequency sonar was not analyzed in this EIS/OEIS.

It is important to note that, as a group, marine mammals have functional hearing ranging from 10 hertz (Hz) to 180 kHz (Southhall et al. 2007). Their best hearing sensitivities are concentrated near the middle of that range. Since active sonar sources operating at 180 kHz or higher dissipate rapidly and are at or outside the upper frequency limit of marine mammals, further consideration and modeling of these higher frequency acoustic sources are not warranted. As such, high-frequency active sonar systems in excess of 180 kHz are not analyzed in this EIS/OEIS.

Table 2-2: Acoustic Systems Quantitatively Modeled

System*	Frequency	Associated Platform	System Use/Description	Currently Used in TMAA	Proposed Use in TMAA
AN/SQS-53C	MF	Surface ship sonar (DDG/CG)	Utilized 70% in search mode and 30% in track mode.	No	Yes
AN/SQS-56	MF	Surface ship sonar (FFG)	Utilized 70% in search mode and 30% in track mode.	No	Yes
AN/SSQ-62 DICASS Sonobuoy	MF	Helicopter and MPA deployed	12 pings, 30 seconds between pings.	No	Yes
AN/AQS-13 or AN/AQS-22	MF	Helicopter dipping sonar	AN/AQS-22: 10 pings/dip, 30 seconds between pings)- also used to represent AN/AQS-13.	No	Yes
AN/SSQ-110A Explosive source Sonobuoy	Impulsive	MPA deployed	Contains two 4.1 lb charges.	No	Yes
MK-48 Torpedo	HF	Submarine	Active for 15 minutes per torpedo run – To be used during SINKEX.	No	Yes
MK-84 Pinger	HF	Submarines, Surface ships and Targets	PUTR target tracking.	No	Yes
PUTR Uplink Transmitter	MF/HF	PUTR	PUTR tracking uplink signal.	No	Yes
MK-39 EMATT	LF	Ship and aircraft deployed	Simulates a target submarine for tracking exercises	No	Yes
AN/BQQ-10	MF	Submarine Sonar	Submarine hull-mounted sonar (2 pings per hour)	No	Yes
AN/BQS-15	HF	Submarine Sonar	Submarine mine detection sonar.	No	Yes
SUS, MK-84	Selectable 3.3 or 3.5 kHz	Limited duration, system is used for communications between surface ship and submarines	Expendable buoy deployed from aircraft and ships used as a signaling device to communicate with submarines. Operating life of 70 seconds.	No	Yes

*System Descriptions are discussed within Appendix H

DDG – Guided Missile Destroyer; CG – Guided Missile Cruiser; DICASS – Directional Command-Activated Sonobuoy System; FFG – Fast Frigate; MF – Mid-Frequency; MPA – Maritime Patrol Aircraft

Table 2-3: Acoustic Systems Not Quantitatively Modeled

System	Frequency	Reason Not Modeled	System Use/Description	Currently used in TMAA	Proposed use in TMAA
AN/SQQ-32	HF	Not used in TMAA	MCM over the side system.	No	No
MK-46, MK-54 Torpedo	HF	Not used in TMAA	Surface ship and aircraft fired exercise torpedo.	No	No
AN/SLQ-25 (NIXIE)	MF	Not used in TMAA	DDG, CG, and FFG towed array.	No	No
AN/SQS-53 and AN/SQS-56 (Kingfisher)	MF	Not used in TMAA	DDG, CG, and FFG hull-mounted sonar (small object detection).	No	No
ADC MK-3 and MK-2	MF	Not used in TMAA	Submarine-fired countermeasure.	No	No
Surface Ship and Submarine Fathometer	12 kHz	System is not unique to military and operates identically to commercially available bottom sounder	Depth finder on surface ships and submarines.	Yes	Yes
SQR-19	Passive	System is a passive towed array emitting no active sonar	A listening device towed behind a surface ship.	Yes	Yes
TB-16/23/29/33	Passive	System is a passive towed array emitting no active sonar	A listening device towed behind a submarine.	Yes	Yes
AN/SSQ-53 DIFAR Sonobuoy, AN/SSQ-101 (ADAR), AN/SQS-77 (VLAD)	Passive	Sonobuoy is passive & emits no active sonar	Passive listening buoys deployed from helicopter or MPA.	No	Yes
AN/SQQ-125 (MAC) Sonobuoy	MF	MPA deployed	Replacement for AN/SSQ-110A, uses electronic, not explosive, sound source	No	Yes
AN/AQS-14/20/24	>200 kHz	System frequency outside the upper limit for marine mammals and not used in TMAA	Helicopter towed array used in MIW for the detection of mines.	No	No

Table 2-3: Acoustic Systems Not Quantitatively Modeled (continued)

System	Frequency	Reason Not Modeled	System Use/Description	Currently used in TMAA	Proposed use in TMAA
Acoustic Detection Countermeasures (MK-1, MK-2, MK-3, MK-4)	MF	Not used in TMAA	Countermeasure package deployed during some ASW events to counter torpedoes.	No	No
Unmanned Underwater Vehicles	MF/HF	Not used in TMAA	Data collection telemetry and mapping sonars may be active sources.	No	No
AN/WSQ-9; ACOMMS	MF/HF	Limited duration, system is used for communications between surface ship and submarines	Surface ship and submarine buoys – operational use of passive hydrophones and arrays and active transducers as system components used to transmit voice and data underwater for safety, data sharing, and communications.	No	Yes

ADC – Acoustic Device Countermeasure; DDG – Guided Missile Destroyer; DIFAR – Directional Frequency Analysis and Recording; FFG – Fast Frigate; HF – High-Frequency; kHz – Kilohertz; MCM – Mine Countermeasures; MF – Mid-Frequency; MIW – Mine Warfare; MPA – Maritime Patrol Aircraft

2.5.3 Force Structure Changes

The Navy will train with new ships, aircraft, and systems as they become operational in the Fleet. Several future platforms and weapon systems have been identified that are in development, and are likely to be incorporated into Navy training requirements within the 10-year planning horizon. Several of these new technologies are in early stages of development, and thus specific concepts of operations, operating parameters, or training requirements are not yet available. However, when made available, information will be incorporated into the development of the EIS/OEIS.

Specific force structure changes and their impact on training within the GOA are based on the Navy's knowledge of future requirements for the use of new platforms and weapons systems and based on the level of information available to evaluate potential environmental impacts. Therefore, this EIS/OEIS, to the extent feasible, will evaluate potential environmental impacts associated with the introduction of the following platforms and weapon systems. Should additional requirements for the use of platforms and weapon systems be needed, separate NEPA and environmental documentation would be required to analyze potential impacts.

2.5.3.1 New Platforms/Vehicles

EA-18G Growler

The EA-18G Growler is an electronic combat version of the FA-18 E/F that will replace the EA-6B Prowler. Analysis within this EIS/OEIS of any EA-6B activity also considers the potential impacts of future activities with the EA-18G. The Growler will have an integrated suite of advanced communications and EC systems that will initially be centered on the Improved Capability (ICAP) III system, but will also include tactical jamming pods, a radar receivers wingtip pods, an advanced crew station, the Airborne

Electronically Scanned Array (AESA) multimode radar, and a communications receiver and jammer. The EA-18G will have a limited self-protection capability requiring aircrews to train for offensive air-to-air missile engagements and conduct missile exercises. The advanced capabilities of the Growler will require greater standoff ranges and broader frequency spectrum access than current systems.

Guided Missile Submarine (SSGN)

Four *Ohio*-class *Trident* submarines that were previously scheduled for inactivation during Fiscal Years 2003 and 2004 were converted to SSGNs over a 5-year period ending in 2008. The primary missions of the SSGN are land attack (STW) and Special Operations Forces (SOF) insertion and support. Secondary missions are the traditional attack submarine missions of Intelligence, Surveillance, and Reconnaissance (ISR), battle space preparation, and sea control.

These ships are armed with up to 154 Tomahawk or Tactical Tomahawk land attack missiles. They have the ability to carry and support a team of 66 SOF personnel for up to 90 days as compared to 15 days for a SOF outfitted Fast Attack Submarine (SSN). Clandestine insertion and retrieval of these SOF is enhanced by the ability to host dual dry deck shelters or Advanced Seal Delivery System. Each SSGN is able to conduct a variety of peace-time, conventional deterrent and combat activities all within the same deployment. The first SSGNs became operational in Fiscal Year (FY) 2007. Their use in Alaska waters will not include the strike mission, but may involve clandestine special operations.

Although potential use of the SSGN in the TMAA is not clear, any impacts would be identical to those of the SSN; therefore no further differentiation of the SSGN in this analysis is necessary.

P-8 Poseidon Multimission Maritime Aircraft (MMA)

The P-8A Poseidon MMA is the Navy's replacement for the aging P-3 Orion aircraft. It is a modified Boeing 737-800ERX that brings together a highly reliable airframe and high-bypass turbo fan jet engine with a fully connected, state-of-the-art open architecture mission system. This combination, coupled with next-generation sensors, will dramatically improve ASW and ASUW capabilities. The MMA will ensure the Navy's future capability in long-range maritime patrol. It will be equipped with modern ASW, ASUW, and ISR sensors. In short, MMA is a long-range ASW, ASUW, ISR aircraft that is capable of broad-area, maritime, and littoral activities. Initial Operational Capability (IOC) is expected in FY 2013.

Analysis within this EIS/OEIS of any P-3 activity also considers the potential impacts of future activities with the P-8A.

The DDG-1000 Zumwalt Class Destroyer

The DDG-1000 Destroyer is the lead ship in a class of next-generation, multimission surface combatants tailored for land attack and littoral dominance, with capabilities designed to defeat current and projected threats as well as improve Strike Group defense. This class of ship is undergoing design and development, and is not expected to be introduced to the Fleet before 2012. Training activities involving this class of ship are addressed in this EIS/OEIS.

Analysis within this EIS/OEIS of surface ship activities also considers the potential impacts of future activities with the DDG-1000.

Unmanned Aerial Systems (UAS)

Fire Scout UAS: The Fire Scout UAS is a Vertical Takeoff and Landing UAS (VTUAS) designed to operate from air-capable ships, carry modular mission payloads (ordnance), and operate using the Tactical Control System and Tactical Common Data Link. It provides day/night real-time ISR and targeting as communication-relay and battlefield management capabilities to support Littoral Combat Ship (LCS)

mission areas of ASW, MIW, and ASUW. Operation of these systems could produce new requirements for the GOA in terms of airspace and frequency management. Fire Scout will be fielded in early LCS versions.

Broad Area Maritime Surveillance (BAMS) UAS: The BAMS UAS is being designed to support persistent, worldwide access through multisensor, maritime ISR providing unmatched awareness of the battlespace. It will support a spectrum of Fleet missions serving as a distributed ISR node in the overall naval environment. These missions include maritime surveillance, Battle-Damage Assessment (BDA), port surveillance and homeland security support, MIW, MI, Surface Warfare (SUW), counter drug activities, and battlespace management. The BAMS will operate at altitudes above 40,000 ft (12.2 km), above the weather, and above most air traffic to conduct continuous open-ocean and littoral surveillance of targets as small as exposed submarine periscopes. Operation of these systems could produce new requirements for range complexes in terms of airspace and frequency management. IOC is anticipated for FY09.

Navy Unmanned Combat Air System (N-UCAS): The N-UCAS (Grumman X-47B) program is a Navy effort to demonstrate the technical feasibility, military utility, and operational value of an aircraft carrier based, networked system of high performance, weaponized UASs to effectively and affordably execute 21st century combat missions, including Suppression of Enemy Air Defenses (SEAD), surveillance, and precision strike within the emerging global command, and control architecture. Operation of these systems could produce new requirements for range complexes in terms of airspace, frequency management, and target sets. IOC of these systems has not yet been established.

2.5.3.2 New Weapons Systems

Under the Proposed Action, the only weapons systems being introduced at this time that warrant evaluation in this EIS/OEIS are the sonobuoys.

Multi-Static Active Coherent (MAC) System

The proposed MAC system, previously referred to as the Advanced Extended Echo Ranging (AEER) system, is used in the same manner and for the same purpose as the EER/Improved EER (IEER) system. The MAC will use the same Air Deployed Active Receiver (ADAR) sonobuoys as the acoustic receiver and will be used for a large area ASW search capability in both shallow and deep water. However, instead of using an explosive AN/SQS-110A as an impulsive source for the active acoustic wave, the MAC system will use a battery-powered (electronic) source for the AN/SSQ 125 sonobuoy. The output and operational parameters for the AN/SSQ-125 sonobuoy (source levels, frequency, wave forms, etc.) are classified; however, this MAC sonobuoy is intended to replace the EER/IEER's use of explosives and is scheduled to be deployed in 2011.

2.5.3.3 New Training Instrumentation Technology

The Navy has identified a specific training instrumentation enhancement to optimize and adequately support required training for all missions and roles assigned to the TMAA. The proposed enhancement for the TMAA is discussed below and will be analyzed in this EIS/OEIS.

Portable Undersea Tracking Range (PUTR)

The PUTR is a self-contained, portable, undersea tracking capability that employs modern technologies to support coordinated undersea warfare training for Forward Deployed Naval Forces (FDNF). PUTR will be available in two variants to support both shallow and deep water remote activities in keeping with Navy requirements to exercise and evaluate weapons systems and crews in the environments that replicate the potential combat area. The system will be capable of tracking submarines, surface ships, weapons,

targets, and Unmanned Underwater Vehicles (UUVs) and distribute the data to a data processing and display system, either aboard ship, or at a shore site.

The PUTR would be developed to support ASW training in areas where the ocean depth is between 300 and 12,000 ft (91 and 3,657 m) and at least 3 nm (5.5 km) from land. However, for exercises occurring within the GOA, the PUTR would be deployed solely within the TMAA. This proposed project would temporarily (for the duration of the exercise) instrument an area on the seafloor from 25-100 nm^2 or smaller, and would provide high fidelity crew feedback and scoring of crew performance during ASW training activities. When training is complete, the PUTR equipment would be recovered.

No onshore construction would take place. Seven electronics packages, each approximately 3 ft (0.9 m) long by 2 ft (0.6 m) in diameter, would be temporarily installed on the seafloor by a range boat, in water depths greater than 600 ft (182 m). The anchors used to keep the electronics packages on the seafloor would be either concrete or sand bags, which would be approximately 1.5 by 1.5 ft (0.45 by 0.45 m) and would weigh approximately 300 pounds. Operation of this range requires that underwater participants transmit their locations via pingers (see "Range Tracking Pingers" below). Each package consists of a hydrophone that receives pinger signals, and a transducer that sends an acoustic "uplink" of locating data to the range boat. The uplink signal is transmitted at 8.8 kHz, 17 kHz, or 40 kHz, at a source level of 190 decibels (dB). The PUTR system also incorporates an underwater voice capability that transmits at 8-11 kHz and a source level of 190 dB. Each of these packages is powered by a D cell alkaline battery. After the end of the exercise the electronic packages would be recovered and the anchors would remain on the seafloor. No additional ASW activity is proposed as a result of PUTR use.

Range tracking pingers would be installed on ships, submarines, and ASW targets when ASW TRACKEX training is conducted on the PUTR. A typical range pinger generates a 12.93-kHz sine wave in pulses with a maximum duty cycle of 30 milliseconds (3 percent duty cycle) and has a design power of 194 dB re 1 micro-Pascal at 1 meter. Although the specific exercise, and number and type of participants will determine the number of pingers in use at any time, a maximum of three pingers and a minimum of one pinger would be used for each ASW training activity. On average, two pingers would be in use for 3 hours each during PUTR operational days.

2.6 ALTERNATIVE 2 – (PREFERRED ALTERNATIVE) INCREASE TRAINING ACTIVITIES, ACCOMMODATE FORCE STRUCTURE CHANGES, CONDUCT ONE ADDITIONAL ANNUAL EXERCISE, AND CONDUCT ONE SINKEX DURING EACH SUMMERTIME EXERCISE

Implementation of Alternative 2 would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional large-scale joint force exercise, occurring over a maximum time period of up to 21 consecutive days during the summer months (April through October).
- Conduct a SINKEX during each summertime exercise (a maximum of two) in the TMAA

Alternative 2 is the Preferred Alternative because it would allow the greatest flexibility for Navy exercise planners to benefit from the unique joint training environment in the ATA.

2.6.1 Proposed New Activity

Alternative 2 proposes the conduct of one type of training activity that is not presently conducted in the TMAA. Under Alternative 2, this type of training would be conducted as discussed below.

2.6.1.1 Sinking Exercise (SINKEX)

A SINKEX is typically conducted by aircraft, surface ships, and submarines in order to take advantage of a full size ship target and an opportunity to fire live weapons.

A SINKEX is conducted under the auspices of a permit from the USEPA. The target is typically a decommissioned combatant or merchant ship that has been made environmentally safe for sinking according to standards set by the U.S. Environmental Protection Agency (USEPA). It is placed in a specific location that is greater than 50 nm (93 km) out to sea and in water depths greater than 6,000 ft (1,830 m) (40 C.F.R. § 229.2) so that when it sinks it will not be a navigation hazard to marine traffic.

Ship, aircraft, and submarine crews typically are scheduled to attack the target with coordinated tactics and deliver live ordnance to sink the target. Inert ordnance is often used during the first stages of the event so that the target may be available for a longer time. The duration of a SINKEX is unpredictable because it ends when the target sinks, but the goal is to give all forces involved in the exercise an opportunity to deliver their live ordnance. Sometimes the target will begin to sink immediately after the first weapon impact and sometimes only after multiple impacts by a variety of weapons. Typically, the exercise lasts for 4 to 8 hours and possibly over 1 to 2 days, especially if inert ordnance, such as 5-inch gun projectiles or MK-82 dummy bombs, is used during the first hours.

The participants and assets could include, but are not limited to:

- One full-size target ship hulk
- One to five CG, DDG, or FFG firing ships
- One to 10 F/A-18, or MPA firing aircraft and One E-2 aircraft for Command and Control
- One or two HH-60H, MH-60R/S, or SH-60B Helicopters
- One firing submarine
- One to three range clearance aircraft.

Some or all of the following weapons could be employed (see Table 2-7):

- Two HARM air-to-surface missiles
- Five Harpoon surface-to-surface or air-to-surface missiles
- One Hellfire air-to-surface missiles
- Three air-to-surface Maverick missiles
- One Penguin air-to-surface missiles
- One surface-to-air Standard Missile 1 and One surface-to-air Standard Missile 2
- 10 MK-82 General Purpose Bombs (seven live, three inert)
- Four MK-83 General Purpose Bombs
- 400 rounds 5-inch gun
- One MK-48 heavyweight submarine-launched torpedo

Figure 2-7 identifies the area with the TMAA that, based upon USEPA requirements, could support a SINKEX.

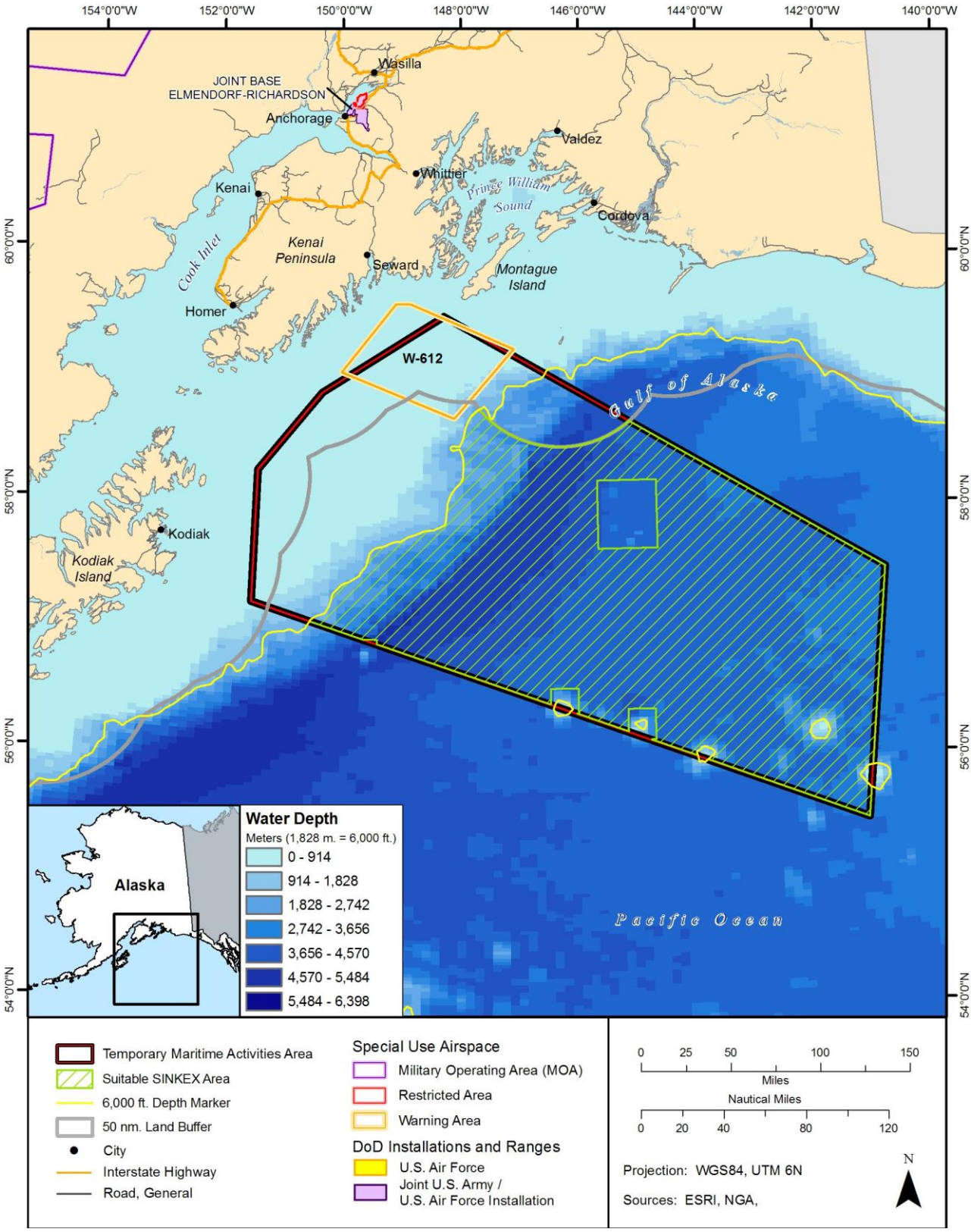


Figure 2-7: Possible Locations of a SINKEX within the TMAA

2.6.2 Revised Level of Activities

Table 2-5 identifies the baseline and proposed increases in activities in the ATA under Alternative 2. In general, most activities would increase under Alternative 2.

2.6.3 Activity Summary Tables

Tables 2-4 through 2-7 summarize the activities in the ATA. Table 2-4 lists the active sources proposed for use in the TMAA under Alternatives 1 and 2. Table 2-5 provides detailed information on each of the No Action Alternative (Baseline), Alternative 1, and Alternative 2 activities. Table 2-6 lists the annual expenditure of ordnance and other related training materials in the TMAA. Table 2-7 lists that annual expenditure of ordnance used during SINKEX activities under Alternative 2.

Table 2-4: Active Systems and Platforms Proposed for Use in the TMAA

System	Hours Modeled (Annual)		Associated Platform/Use
	Alt 1	Alt 2	
AN/SQS-53	289	578	DDG and CG hull-mounted sonar
AN/SQS-56	26	52	FFG hull-mounted sonar
AN/BQQ-10	24	48	Submarine hull-mounted sonar
AN/AQS-13 or AN/AQS-22	96	192	Helicopter dipping sonar
BQS-15	12	24	SSN navigation
PUTR Transponders	40	80	Portable Undersea Tracking Range
MK-84 Range Tracking Pingers	40	80	Ships, submarines, ASW targets
DICASS Sonobuoy (AN/SSQ-62)	133	266	MPA deployed sonobuoys
IEER Sonobuoy (AN/SSQ-110A)	20	40	MPA deployed sonobuoys
MAC Sonobuoy (AN/SSQ-125)	20	40	MPA deployed sonobuoys
SUS, MK-84	12	24	Surface Ships and Aircraft
EMATT	6	12	Surface ships and Aircraft

CG – Guided Missile Cruiser; DDG – Guided Missile Destroyer; FFG – Fast Frigate; DICASS – Directional Command-Activated Sonobuoy System; HF – High-Frequency; MF – Mid-Frequency.

Table 2-5: Current and Proposed Annual Level of Activities in the Alaska Training Areas

Range Activity	Platform	System or Ordnance	No Action Alternative	Alternative 1	Alternative 2	Location
ANTI-AIR WARFARE (AAW)						
Aircraft Combat Maneuvers	EA-6B, EA-18G, FA-18, F-16, F-15, F-22	None	300 sorties	300 sorties	600 sorties	TMAA, Air Force SUA[1]
Air Defense Exercise	FA-18, F-16, F-15, F-22, EA-6B, EA-18G, P-3C, P-8 MMA, CVN, CG, DDG, FFG	None	3 events	4 events	8 events	TMAA
S-A Missile Exercise	CVN, CG, DDG, FFG	Sea Sparrow Missile, Standard Missile 1, or RAM Target: BQM-74E	2 events	3 events	6 events	TMAA
Surface-to-Air (S-A) Gunnery Exercise	CG, DDG, FFG, AOE	5”/54 BLP, 20mm CIWS, 7.62mm Target: Towed TDU-34	2 events	3 events	6 events	TMAA
Air-to-Air (A-A)Missile Exercise	FA-18, F-16, F-15, F-22 E-2C, EA-6B, EA-18G	AIM-7, AIM-9, AIM-120 AMRAAM Targets: TALD or LUU-2B/B	2 events	3 events	6 events	TMAA, Air Force SUA[1]
ANTI-SURFACE WARFARE (ASUW)						
Visit Board Search and Seizure	MH-60S, RHIB, NSW Personnel	None	12 events	12 events	24 events	TMAA
Air-to-Surface (A-S) Missile Exercise	MH-60R/S, FA-18, F-16, F-15, F-22, EA-6B, EA-18G	CATM-114 Hellfire, CATM-84 (SLAM-ER), an CATM-84 Harpoon, or an CATM-65 Maverick (all captive carry/not released)	1 events	2 events	4 events	TMAA

Table 2-5: Current and Proposed Annual Level of Activities in the Alaska Training Areas (continued)

Range Activity	Platform	System or Ordnance	No Action Alternative	Alternative 1	Alternative 2	Location
Air-to-Surface (A-S) Bombing Exercise	FA-18, F-16, F-15, F-22	MK-82 (live),MK-83 (live), MK-84 (live) BDU-45 (inert), MK-58 marine marker	12 events	18 events	36 events	TMAA
Air-to-Surface (A-S) Gunnery Exercise	MH-60R/S	GAU-16 (0.50-cal) or M-60 (7.62mm) machine gun Targets: HSMST, Trimaran, SPAR, Surface Target Balloon	5 events	7 events	14 events	TMAA
Surface-to-Surface (S-S) Gunnery Exercise	CVN, CG, DDG, FFG, AOE	5”/54 BLP, 20mm CIWS, 25 mm, 7.62mm, 57mm, .50 cal Targets: HSMST, Trimaran, SPAR, Surface Target Balloon	5 events	6 events	12 events	TMAA
Maritime Interdiction	All	None	14 events	14 events	28 events	TMAA
Sea Surface Control	FA-18, EA-6B, EA-18G, P-3C, P-8 MMA, CG, DDG, FFG	None	6 events	6 events	12 events	TMAA
Sink Exercise	FA-18, F-16, F-15, F-22, EA-6B, EA-18G, P-3C, P-8 MMA, MH-60R/S, CVN, CG, DDG, FFG	MK-82 (Inert), MK-82 (live), MK-83, AGM-88 HARM, AGM-84 Harpoon, AGM-65 Maverick, AGM-114 Hellfire, AGM-119 Penguin, Standard Missile 1, Standard Missile 2, 5”/54 BLP	N/A	N/A	2 events	TMAA

Table 2-5: Current and Proposed Annual Level of Activities in the Alaska Training Areas (continued)

Range Activity	Platform	System or Ordnance	No Action Alternative	Alternative 1	Alternative 2	Location
ANTI-SUBMARINE WARFARE (ASW)						
Anti-Submarine Warfare (ASW) Tracking Exercise - Helicopter	MH-60R	Targets: SSN, MK-39 EMATT Sonobuoys: AN/AQS-22, SSQ-36 BT, SSQ-53 DIFAR (passive), SSQ-62 DICASS (active), SSQ-77 VLAD Other: MK-58 marine marker	N/A	22 events	44 events	TMAA
Anti-Submarine Warfare (ASW) Tracking Exercise - MPA	P-3C, P-8 MMA	Targets: SSN, MK-39 EMATT Sonobuoys: SSQ-36 BT, SSQ-53 DIFAR (passive), SSQ-62 DICASS (active), SSQ-77 VLAD Other: MK-58 marine marker	N/A	13 events	26 events	TMAA
ASW Tracking Exercise - Extended Echo Ranging (EER) (includes IEER and MAC)	P-3C, P-8 MMA	SSQ-110A EER/IEER, SSQ-125 MAC, SSQ-77 VLAD	N/A	2 events	4 events	TMAA
ASW Tracking Exercise - Surface Ship	DDG, FFG	SQS-53C, SQS-56 MFA sonar Targets: SSN, MK-39 EMATT	N/A	2 events	3 events	TMAA
ASW Tracking Exercise - Submarine	SSBN, SSGN	Targets: MK-39 EMATT	N/A	2 events	3 events	TMAA
ELECTRONIC COMBAT (EC)						
Electronic Combat (EC) Exercises	EA-6B, EA-18G, P-3, EP-3, CVN, CG, DDG, FFG	None	4	5 events	10 events	TMAA, Air Force SUA[1]

Table 2-5: Current and Proposed Annual Level of Activities in the Alaska Training Areas (continued)

Range Activity	Platform	System or Ordnance	No Action Alternative	Alternative 1	Alternative 2	Location
Chaff Exercises	EA-6B, EA-18G, P-3, EP-3, FA-18, CVN, CG, DDG, FFG, AOE	Chaff	2 events	2 events	4 events	TMAA, Air Force SUA[1]
Counter Targeting Exercises	EA-6B, EA-18G, P-3, EP-3, FA-18, CVN, CG, DDG, FFG, AOE	None	4 events	4 events	8 events	TMAA
NAVAL SPECIAL WARFARE (NSW)						
Special Warfare Operations	C-130, MH-60S, SDV, RHIB, NSW Personnel.	None	10 events	10 events	20 events	TMAA, Air Force SUA[1], Army Training Lands[1]
STRIKE WARFARE (STW)						
Air-to-Ground Bombing Exercise	FA-18, F-16, F-15, F-22, EA-6B, EA-18G	MK-82/83/84 (live/Inert), BDU-45 (inert), CATM-88C (not released)	150 sorties	150 sorties	300 sorties	Air Force SUA[1], Army Training Lands[1]
Personnel Recovery	CVN, CG, DDG, FFG, AOE, MH-60S, RHIB, NSW Personnel.	None	3 events	4 events	8 events	Air Force SUA[1], Army Training Lands[1]
SUPPORT OPERATIONS						
Deck Landing Qualifications	Helicopters (Air Force, Army, Coast Guard – various)	None	4 events	6 events	12 events	TMAA

1: Activities within and upon these areas are covered under separate NEPA analysis.

Table 2-6: Annual Ordnance and Expendables Use in the TMAA

Training Area and Ordnance/Expendable Type	Number of Rounds/Expendables per Year				
	No Action	Alternative 1	% Increase over No Action	Alternative 2	% Increase over No Action
Gulf of Alaska Temporary Military Activities Area (TMAA)					
BOMBS					
BDU-45 (Inert)	72	108	50.0%	216	200.0%
MK-82 (HE)	42	64	52.4%	128	204.8%
MK-83 (HE)	4	6	50.0%	12	200.0%
MK-84 (HE)	2	2	0.0%	4	100.0%
MISSILES					
AIM-7 Sparrow	6	9	50.0%	18	200.0%
AIM-9 Sidewinder	8	12	50.0%	24	200.0%
AIM-120 AMRAAM	6	9	50.0%	18	200.0%
Standard Missile	2	3	50.0%	6	200.0%
NAVAL GUNSHELLS					
20mm (Inert)	8,000	10,000	25.0%	20,000	150.0%
25mm (Inert)	2,500	3,000	20.0%	6,000	140.0%
57mm (Inert)	0	100	N/A	200	N/A
76mm (HE)	10	14	40.0%	28	180.0%
76mm (Inert)	6	8	33.3%	16	166.7%
5 inch (HE)	30	42	40.0%	84	180.0%
5 inch (Inert)	18	24	37.5%	48	166.7%
SMALL ARMS ROUNDS					
7.62mm Projectile	4,000	4,500	12.5%	9,000	125.0%
.50 cal machine gun	1,000	1,200	20.0%	2,400	140.0%
PYROTECHNICS					
LUU-2B/B Flare	12	18	50.0%	36	200.0%
MK-58 Marine Marker (Day/Night smoke/flare)	20	60	200.0%	120	500.0%
TARGETS					
MK-39 Expendable Mobile ASW Training Target (EMATT)	N/A	6	N/A	12	N/A
Tactical Air Launched Decoy (TALD)	8	12	50.0%	24	200.0%
TDU-34 Towed Target (Retained, not expended)	2	3	50.0%	6	200.0%
BQM-74E	2	2	0.0%	4	100.0%
SPAR (Recovered)	10	12	20.0%	24	140.0%
Killer Tomato (Recovered)	10	12	20.0%	24	140.0%

Table 2-6: Annual Ordnance and Expendables Use in the TMAA (continued)

Training Area and Ordnance/Expendable Type	Number of Rounds/Expendables per Year				
	No Action	Alternative 1	% Increase over No Action	Alternative 2	% Increase over No Action
SONOBUOYS					
SSQ-36 BT	24	60	150%	120	400%
SSQ-53 DIFAR Passive	N/A	500	N/A	1,000	N/A
SSQ-62 DICASS Active	N/A	133	N/A	267	N/A
SSQ-77 VLAD	N/A	60	N/A	120	N/A
SSQ-110A/MAC	N/A	40	N/A	80	N/A
CHAFF					
ALE-43 Dispenser (Aluminized glass roll)	540 lbs	540 lbs	0.0%	1080 lbs	100.0%
SIGNALING DEVICE					
SUS MK-84	N/A	12	N/A	24	N/A

HE – High Explosive

Table 2-7: Representative Annual Ordnance Expended During SINKEX in the TMAA

Ordnance Type	Number of Rounds per Year[2]
BOMBS[1]	
MK-82	14
MK-82 (Inert)	6
MK-83	8
MISSILES	
HARM	4
Harpoon	10
Maverick	6
Hellfire	2
Penguin Missile	2
Standard Missile 1	2
Standard Missile 2	2
TORPEDOES	
MK-48	2
NAVAL GUNSHELLS	
5 inch	800
TOTAL	**858**

1 MK-80 series bombs will be replaced with BLU series bombs
2 Total rounds are cumulative for 2 separate SINKEXs

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3 Affected Environment and Environmental Consequences

3 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter describes existing environmental conditions (affected environment) for resources potentially affected by the alternatives described in Chapter 2. Potential biological, physical, cultural, and social resource impacts (environmental consequences) are identified, described, and evaluated for the Proposed Action and its Alternatives. As discussed in Chapter 2 under the No Action Alternative, training activities would continue at current levels. Although the No Action Alternative would not meet the Navy's long-term training needs in the Alaska Training Areas (ATA), existing conditions serve as the baseline for analyzing the impacts of the Action Alternatives (Alternative 1 and Alternative 2, the Preferred Alternative).

The affected environment and environmental consequences are described and analyzed according to 14 categories of resources. The resource categories and their sections in this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS), from here on referred to as EIS/OEIS are:

- Air Quality (3.1)
- Expended Materials (3.2)
- Water Resources (3.3)
- Acoustic Environment (Airborne) (3.4)
- Marine Plants and Invertebrates (3.5)
- Fish (3.6)
- Sea Turtles (3.7)
- Marine Mammals (3.8)
- Birds (3.9)
- Cultural Resources (3.10)
- Transportation and Circulation (3.11)
- Socioeconomics (3.12)
- Environmental Justice and Protection of Children (3.13)
- Public Safety (3.14)

Land-based resource categories (Land Use, Geology and Soils, and Terrestrial Biological Resources), are not analyzed in this EIS/OEIS, as existing and proposed Navy activities and impacts to these resources have already been considered and analyzed in separate environmental documents by the United States (U.S.) Air Force (Air Force) and the U.S. Army (Army). Resource areas carried forward for analysis include reference to the appropriate Air Force/Army environmental analyses for addressing inland areas and their associated impacts from Navy training activities. Proposed Navy training activities that have the potential to affect land areas are evaluated in the aforementioned Air Force and Army environmental documents. Existing and planned activities were accounted for by Army and Air Force range planners. Proposed Navy training activities that do not have the potential to affect land areas are addressed and analyzed as appropriate in the resource sections listed above. Therefore, as noted in Chapter 2, separate environmental analyses of impacts from Navy training activities conducted in the inland training areas on Air Force/Army ranges is not required.

During the environmental impact analysis process, the resources analyzed are identified and the expected geographic scope of potential impacts for each resource is defined. Known as the resource's Region of Influence (ROI), this area is defined as the geographic area in which impacts to the subject resource have

the potential to occur. For the majority of resource categories, the ROI coincides with the air, sea, and undersea training areas of the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). For some resources, the ROI encompasses broader regions within the GOA.

In determining environmental consequences, this chapter incorporates current resource protection measures such as Standard Operating Procedures (SOPs), Best Management Practices (BMPs), and conservation measures that are integral to the activities covered by the Proposed Action and its Alternatives. Mitigation measures are discussed at the end of each resource section and summarized in Chapter 5.

The specific contributions of a particular project to global or regional climate change generally cannot be identified based on existing scientific knowledge, because they typically are extremely small. Also, climate processes are understood at only a general level. Cumulative regional contributions to climate change are addressed in Chapter 4.

3.0 GENERAL APPROACH TO ANALYSIS

The methods used in this EIS/OEIS to assess resource impacts associated with the proposed alternatives include the procedural steps outlined below:

- Describe existing resource conditions.
- Review existing federal and state regulations and standards relevant to resource-specific management and/or protection.
- Identify critical resource conditions or areas that require specific analytical attention, such as designated endangered species critical habitat.
- Analyze the warfare areas and activities to determine what stressors may affect the particular resource.
- Review and analyze data sources for information on stressor impacts to the resource, including modeling efforts and scientific research.
- Determine specific impacts to the resource associated with the stressors that result from Navy activities.
- Adjust initial impact determinations to account for use of SOPs, BMPs, and other mitigation measures.
- Determine overall impacts to the resource associated with the Proposed Action and Alternatives, given the applicable regulatory framework.
- Summarize impact findings with respect to resource effects and compliance with regulations and Navy policies for each alternative.

Additional steps may be added to some resource evaluations to address unique resource characteristics or specific regulatory and public-issue concerns.

3.0.1 Stressors

The EIS/OEIS interdisciplinary team and Navy subject matter experts used a screening process to analyze the warfare areas and training activities to identify specific activities in the alternatives that could act as stressors to resources. Other information that was evaluated to identify and analyze stressors included public and agency scoping comments, previous environmental analyses, agency consultations, resource-specific information, and applicable laws, regulations, and executive orders. This process was used to

focus the information presented and analyzed in the affected environment and environmental consequences sections of this EIS/OEIS. Table 3-1 summarizes warfare areas, the number of yearly training activities of each type that would be associated with each alternative, and the stressors that potentially would occur within each warfare area because of those activities. The stressors and some of the mechanisms that would result in stress include:

- Vessel movements (disturbance and collisions);
- Low-altitude aircraft overflights (disturbance and strikes);
- Sonar (harassment);
- Weapons firing/nonexplosive practice ordnance (disturbance, strikes, and habitat alteration);
- High-explosive ordnance (harassment, strikes, and habitat alteration); and
- Expended materials (habitat alteration, entanglement, ingestion, and hazardous materials).

Table 3-1: Summary of Potential Stressors

		Number of Activities			Stressors					
Warfare Area and Activity	**Training Area(s)**	**No Action Alternative**	**Alternative 1**	**Alternative 2**	**Vessel Movements**	**Aircraft Overflights**	**SONAR**	**Weapons Firing/Non-Explosive Practice Ordnance**	**High-Explosive Ordnance**	**Expended Materials**
Anti-Air Warfare (AAW)										
Air Combat Maneuver (ACM)	TMAA, Air Force Special-Use Airspace (SUA)	300	300	600		✓				✓
Air Defense Exercise (ADEX)	TMAA	3	4	8	✓	✓				✓
Surface-to-Air Missile Exercise (S-A MISSILEX)	TMAA	2	3	6	✓	✓		✓	✓	✓
Surface-to-Air Gunnery Exercise (S-A GUNEX)	TMAA	2	3	6	✓	✓		✓	✓	✓
Air-to-Air (A-A) MISSILEX	TMAA, Air Force SUA	2	3	6		✓		✓	✓	✓
Anti-Surface Warfare (ASUW)										
Visit Board Search and Seizure (VBSS)	TMAA	12	12	24	✓	✓				
Air-to-Surface (A-S) MISSILEX	TMAA	1	2	4	✓	✓		✓	✓	✓
Air-to-Surface Bombing Exercise (A-S BOMBEX)	TMAA	12	18	36	✓	✓		✓	✓	✓
Air-to-Surface (A-S) GUNEX	TMAA	5	7	14	✓	✓		✓	✓	✓
Surface-to-Surface (S-S) GUNEX	TMAA	5	6	12	✓			✓	✓	✓
Maritime Interdiction Exercise (MI)	TMAA	14	14	28	✓	✓	✓			✓
Sea Surface Control (SSC)	TMAA	6	6	12	✓	✓				
Sinking Exercise (SINKEX)	TMAA	N/A	N/A	2	✓	✓		✓	✓	✓

Table 3-1: Summary of Potential Stressors (continued)

		Number of Activities			Stressors					
Warfare Area and Activity	**Training Area(s)**	**No Action Alternative**	**Alternative 1**	**Alternative 2**	**Vessel Movements**	**Aircraft Overflights**	**SONAR**	**Weapons Firing/Non-Explosive Practice Ordnance**	**High-Explosive Ordnance**	**Expended Materials**
Anti-Submarine Warfare (ASW)										
ASW Tracking Exercise – Helicopter (TRACKEX-Helo)	TMAA	N/A	22	44	✓	✓	✓		✓	✓
ASW Tracking Exercise – Maritime Patrol Aircraft (TRACKEX-MPA)	TMAA	N/A	13	26	✓	✓	✓		✓	✓
ASW Tracking Exercise - Extended Echo Ranging (EER) (Includes IEER and AEER)	TMAA	N/A	2	4		✓	✓		✓	✓
ASW Tracking Exercise - Surface Ship (TRACKEX-Surface)	TMAA	N/A	2	3	✓		✓			✓
ASW Tracking Exercise – Submarine (TRACKEX-Sub)	TMAA	N/A	2	3	✓	✓	✓			✓
Electronic Combat (EC)										
Electronic Combat (EC) Exercises	TMAA, Air Force SUA	4	5	10	✓	✓				✓
Chaff Exercise (CHAFFEX)	TMAA, Air Force SUA	2	2	4	✓	✓				✓
Counter Targeting Exercises	TMAA	4	4	8	✓	✓				
Naval Special Warfare (NSW)										
Special Warfare Operations	TMAA, Air Force SUA, Army Ranges	10	10	20	✓	✓		**N/A**		**N/A**

Table 3-1: Summary of Potential Stressors (continued)

		Number of Activities			Stressors					
Warfare Area and Activity	**Training Area(s)**	**No Action Alternative**	**Alternative 1**	**Alternative 2**	**Vessel Movements**	**Aircraft Overflights**	**SONAR**	**Weapons Firing/Non-Explosive Practice Ordnance**	**High-Explosive Ordnance**	**Expended Materials**
Strike Warfare										
Air-to-Ground Bombing Exercise (A-G BOMBEX)	Air Force SUA, Army Ranges	150	150	300		**N/A**		**N/A**	**N/A**	**N/A**
Personnel Recovery (PR)	TMAA, Air Force SUA, Army Ranges	3	4	8	✓	✓				
Support Operations										
Deck Landing Qualifications (DLQs)	ATA	4	6	12	✓	✓				

Note: N/A – Not Applicable because activity and stressors have been analyzed in previous environmental documents by the United States Air Force and/or the United States Army.

Table 3-2 shows the relationships between stressors and the physical and biological resources that are evaluated in this EIS/OEIS. These tables provide the organizational framework for the description of environmental impacts presented in the following sections.

Table 3-2: Physical and Biological Resources That Could Be Affected by Stressors Associated with the Alternatives

Potential Stressor	Water Resources	Marine Plants and Invertebrates	Fish and EFH	Sea Turtles	Marine Mammals	Birds
Vessel Movements						
Vessel Disturbance		✓	✓	✓	✓	✓
Vessel Collisions		✓	✓	✓	✓	✓
Aircraft Overflights						
Aircraft Disturbance			✓	✓	✓	✓
Aircraft Strikes						✓
SONAR						
Mid- and High-Frequency Sonar			✓	✓	✓	
Weapons Firing/Nonexplosive Practice Ordnance						
Weapons Firing Disturbance			✓	✓	✓	✓
Nonexplosive Ordnance Strikes		✓	✓	✓	✓	✓
Nonexplosive Ordnance Disturbance		✓	✓	✓	✓	✓
High Explosive Ordnance						
At-sea Explosions	✓	✓	✓	✓	✓	✓
Explosive Ordnance		✓	✓	✓	✓	✓
Expended Materials						
Ordnance-Related Materials	✓	✓	✓	✓	✓	
MK-58 Marine Markers			✓	✓	✓	✓
Target Related Materials		✓	✓	✓	✓	✓
Expendable Mobile ASW Training Targets		✓	✓	✓	✓	
Sonobuoys	✓	✓	✓	✓	✓	✓
Chaff	✓	✓	✓	✓	✓	✓
Flares	✓					

3.0.2 Data Sources

A systematic review of relevant literature, regulatory requirements, mitigation provisions, and data was conducted to complete the technical and compliance analysis for each resource category. Both published and unpublished documents were used, including journals, books, periodicals, bulletins, Department of Defense operations reports, theses, dissertations, endangered species recovery plans, species management plans, and other technical reports published by government agencies, private businesses, or consulting firms. The scientific literature was also consulted during the search for geographic location data (geographic coordinates) on the occurrence of marine resources within the GOA.

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3.1 Air Quality

3.1 AIR QUALITY

3.1.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for air quality includes the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska Final EIS* (Army 2004).

3.1.1.1 Existing Conditions

Climate

The GOA has a typical maritime climate, being somewhat warmer than adjacent land areas in winter and somewhat cooler than these land areas in summer. The GOA is exposed to storms off the North Pacific Ocean. Consequently, it frequently experiences high winds and precipitation. Coastal southeastern Alaska adjoining the GOA is typically cool and cloudy, with frequent heavy precipitation. Even during the winter, most of the precipitation there falls as rain. The warmest weather is in June, July, and August. The driest months occur from May through August (Naval Research Laboratory 1993).

Winds in the central GOA are primarily from the east or northeast, due to the interaction of the Pacific High with the GOA Low. Wind speeds often exceed 50 miles (mi) per hour (80 kilometers [km] per hour) except during the summer, when winds are relatively calm. Along the coast, this general circulation pattern may be altered locally by downslope surface winds following major river valleys that empty into the GOA, or by winds blowing through gaps in the ranges of mountains that border the GOA.

The GOA is very cloudy throughout the year. During summer, more than 90 percent of observations indicate substantial (5/8 or more) low cloud cover. Cloud bases are normally higher in summer than in other seasons, with cloud tops extending to very high altitudes (Naval Research Laboratory 1993). Visibility in the central GOA is generally low throughout the year, with ceilings of less than 300 feet and visibility less than 1.0 nm occurring about one-third of the time (Naval Research Laboratory 1993).

The continental climate in Alaska's interior, where Air Force air ranges and Army land ranges are located, is characterized by long, very cold winters and short, warm summers. The mean annual temperature in Fairbanks, for example, is 28 degrees Fahrenheit (°F) (-2 degrees Celsius [°C]). Daytime summer temperatures in the interior of Alaska are relatively high, in large part due to the long days, and rain showers are common. Most of southern Alaska, such as the Anchorage metropolitan area, has a climate intermediate between the continental climate of the interior and the maritime climate along the coast.

Regional Emissions

No stationary sources of air pollutant emissions exist within the GOA. Unknown quantities of air pollutants are emitted by commercial and recreational vessels operating in the GOA. Given the low population density of coastal areas in southeastern Alaska and prevailing wind directions, air pollutants generated in adjacent land areas likely have little or no effect on air quality in the GOA.

In mainland Alaska, the Anchorage, Fairbanks, and Juneau urban areas are large area sources of air pollutants, but these pollutants readily disperse during warm weather. In winter, when ground-based inversions are common, air pollutants from urban sources such as wood-burning stoves and automobiles

become concentrated near the ground, where their concentrations may exceed health-based air quality standards. In rural areas, mining, oil extraction and refining, timber harvesting and processing, and other extractive industries are major point sources of air pollutants, as are large wildfires.

Existing Air Quality

The temporary boundaries of the TMAA form a rough rectangle oriented from northwest to southeast, approximately 300 nautical miles (nm) (556 km) long by 150 nm (278 km) wide, situated south of Prince William Sound and east of Kodiak Island. The TMAA is 42,146 square nautical miles (nm^2) (144,556 square kilometers [km^2]) in area.

With the exception of Cape Cleare on Montague Island, located over 12 nm (22 km) from the northern edge of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore. Therefore, air quality in the TMAA is not monitored. However, the GOA is well ventilated by air masses moving in from the North Pacific Ocean. There are no substantial sources of air pollutants in the GOA, and the frequent precipitation probably scavenges from the air any particulates or other pollutants that might be present. Therefore, the air quality in the GOA is expected to be very good.

Alaskan lands in the study area also should have generally good air quality because there are few industries or urban areas to generate criteria air pollutants. The State is divided into the Cook Inlet, North Alaska, South-Central Alaska, and Southeastern Alaska Intrastate Air Quality Control Regions (40 Code of Federal Regulations [C.F.R.], Part 81). The only portions of the State where air quality is regularly monitored, however, are the three major urban areas– Fairbanks, Anchorage, and Juneau. Monitoring data indicate that the two air pollutants of major concern in Alaska are carbon monoxide (CO) and particulate matter (PM).

In accordance with the federal Clean Air Act (CAA), the State of Alaska has adopted (and the U.S. Environmental Protection Agency [USEPA] has generally approved) a State Implementation Plan (SIP) with provisions to maintain the air quality in attainment areas and to improve the air quality in nonattainment areas. The SIP, however, does not extend to portions of the State designated as Indian Country under federal law (18 United States Code [U.S.C.] 1151); these areas are administered directly by USEPA.

Air quality regions that do not meet the National Ambient Air Quality Standards (NAAQS) for a specific criteria air pollutant are designated as nonattainment areas under the CAA. Anchorage and Fairbanks were designated as nonattainment areas for CO in 1990, but in 2004 were redesignated as CO maintenance areas (Alaska Department of Environmental Conservation [ADEC] 2007). Eagle River, near Anchorage, and Juneau are designated as nonattainment areas for particulates under 10 microns (μm) (PM_{10}), but are in the process of being redesignated as maintenance areas for PM_{10} (ADEC 2009). Concentrations of fine particulates continue to be a concern in developed areas of the State (see below). All other portions of the State are in attainment of the NAAQS, or unclassifiable due to an absence of monitoring data.

USEPA recently updated the NAAQS for PM. USEPA retained the current 24-hour PM_{10} standard of 150 micrograms (μg)/cubic meter (m^3) and eliminated the annual PM_{10} standard. USEPA increased the stringency of the standard for particulates under 2.5 μm ($PM_{2.5}$) by lowering the previous 24-hour standard of 65 $\mu g/m^3$ to 35 $\mu g/m^3$. USEPA left the annual $PM_{2.5}$ standard of 15 $\mu g/m^3$ in place. Until USEPA revised the standard, Alaska had been in compliance with the $PM_{2.5}$ standard. Recent $PM_{2.5}$ monitoring shows Fairbanks North Star Borough (FNSB) exceeding the more stringent revised $PM_{2.5}$

standard. In October 2009, USEPA designated the FNSB as nonattainment for $PM_{2.5}$, with respect to the 24-hour averaging period (USEPA 2009). The Fort Wainwright Main Post is encompassed by the new boundaries of the FNSB $PM_{2.5}$ nonattainment area.

Sensitive Receptors

Air quality is an environmental concern primarily because it affects human health. A secondary concern is its potential effects on vegetation and wildlife. In addition, some air pollutants can damage structures, reduce visibility, or contribute to climate change. On the ocean ranges in the study area, the air pollutants generated by the Proposed Action would mostly affect marine biological resources. Crews of vessels and recreational users of the GOA could also be affected by air pollutants, but such individuals are expected to be few in number and the durations of substantial exposures to these pollutants very limited.

Climate Change

Global warming is the increase in the average temperature of the Earth's near-surface air and oceans since the mid-20th century. Global surface temperatures have increased by an average of about 0.74 °C or by about 1.3 °F during the last century (Intergovernmental Panel on Climate Change [IPCC] 2007). Climate change has been attributed to many factors, including increasing atmospheric concentrations of carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), and other greenhouse gases (GHG). Most of the observed temperature increase since the mid-20th century is correlated with increasing concentrations of GHGs emitted by human activities, such as combustion of fossil fuels and deforestation (IPCC 2007).

The GHG effect is the process by which absorption and emission of radiation by gases in the atmosphere warm a planet's lower atmosphere and surface. GHGs are transparent to long-wave radiation from the sun; this radiation passes through the atmosphere with little absorption or reflection, and warms the earth's surface. GHGs trap short-wave (infrared) radiation emitted by the earth's surface, however, preventing it from dissipating into space and re-radiating it down to the surface of the earth. The existence of the greenhouse effect is not disputed. The issues are how the strength of the greenhouse effect changes with increases in the concentrations of GHGs in the atmosphere, and the relationships among natural sources and sinks of GHGs, human sources of GHGs, and atmospheric concentrations of GHGs.

CO_2 is the major GHG emitted by human activities, primarily from the combustion of fossil fuels such as coal, oil, and natural gas. Atmospheric concentrations of CO_2 have increased by 36% since the mid-1700s (USEPA 2008). This level is much higher than at any time during the last 650,000 years (Neftel et al. 1985). Less direct geological evidence indicates that CO_2 values this high were last seen about 20 million years ago (Pearson and Palmer 2000). The burning of fossil fuel has produced about 75 percent of the increase in CO_2 from human activity over the past 20 years.

GHG emissions for a proposed action can be inventoried, based on methods prescribed by state and federal agencies. However, the specific contributions of a particular project to global or regional climate change generally cannot be identified based on existing scientific knowledge, because individual projects typically have a negligible effect. Also, climate processes are understood at only a general level. Cumulative effects on climate change, including estimates of annual GHG emissions under the Preferred Alternative, are addressed in Chapter 4.

3.1.1.2 Current Requirements and Practices

Equipment used by military organizations within the GOA, including ships and other marine vessels, aircraft, and other equipment, are properly maintained in accordance with applicable Navy and Marine Corps requirements. Operating equipment meets federal and state emission standards, where applicable.

3.1.2 Environmental Consequences

As noted in Section 3.1.1, the ROI for air quality includes the TMAA. Navy training activities that occur within the Air Force inland Special Use Airspace and the Army inland training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) are analyzed in this EIS/OEIS pursuant to Executive Order (EO) 12114.

3.1.2.1 Previous Analyses

Impacts related to air quality were previously evaluated in Sections 3.9, 4.9, and Appendix K of the *Alaska Military Operations Areas EIS* (USAF 1995); Sections 3.2.4 and 4.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007); Sections 3.2, 3.15, 4.2, and 4.15 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999); and Sections 3.2 and 4.2 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.1.2.2 Regulatory Framework

By regulation, air quality is defined primarily by the ambient air concentrations of seven major air pollutants determined by USEPA to substantially affect the health or welfare of the general public. These "criteria pollutants" are CO, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), suspended particulate matter less than or equal to 10 μm in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 μm in diameter ($PM_{2.5}$), and lead. USEPA calls these pollutants "criteria" air pollutants because it regulates them by developing human health or environmental criteria (science-based guidelines) for setting permissible levels.

Ambient air quality is defined by the atmospheric concentrations of criteria air pollutants and other selected chemical compounds at particular locations determined to be generally representative of local or regional conditions. Lower ambient concentrations of these air pollutants indicate higher air quality. Ambient air quality data are generally reported as a mass per unit volume (e.g., $\mu g/m^3$ of air) or as a volume fraction (e.g., parts per million [ppm] by volume). USEPA has established NAAQS for these pollutants (Table 3.1-1). Areas that exceed a NAAQS are designated as "nonattainment" for that pollutant, while areas that are in compliance with a NAAQS are in "attainment" for that pollutant.

USEPA typically delegates the regulation of air quality to local air quality management agencies. The CAA also allows states to establish air quality standards more stringent than the NAAQS. The GOA is located offshore of the State of Alaska in USEPA Region 10; some elements of the Proposed Action occur within the State. Statutory authority for air quality regulation in Alaska is delegated to the Air and Water Quality Division of ADEC. State of Alaska air quality standards generally correspond to federal primary standards. Additional Alaska standards include a 1-hour O_3 standard and an annual PM_{10} standard (Table 3.1-1).

Areas in which ambient air concentrations of a pollutant exceed a NAAQS are designated as "nonattainment" for that pollutant. Nonattainment areas for some criteria pollutants are further classified, depending upon the severity of their air quality problem, to facilitate their management:

- Ozone – marginal, moderate, serious, severe, and extreme;
- Carbon Monoxide – moderate and serious;
- Particulate Matter – moderate and serious.

Nonattainment areas are required to develop and execute plans, known as SIPs, that demonstrate how the area will meet the NAAQS. Areas that have achieved attainment may be designated as "maintenance areas," which are subject to maintenance plans showing how the area will continue to meet federal air quality standards.

The ambient air quality levels measured at a particular location are determined by the interactions of pollutant emissions, chemical properties and reactions that occur in the atmosphere, and meteorology. Emission considerations include the types, amounts, and locations of pollutants emitted into the atmosphere. Chemical reactions can transform pollutant emissions into criteria pollutants. Meteorological considerations include wind and precipitation patterns affecting the distribution, dispersion, and removal of pollutant emissions.

Table 3.1-1: National and State of Alaska Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS		Alaska State Standard
		Primary	Secondary	
Ozone (O_3)	1-Hour		Same as Primary Standard	235 µg/m^3
	8-Hour	0.075 ppm (157 µg/m^3)		
Carbon Monoxide (CO)	8-Hour	9.0 ppm (10 milligrams (mg)/m^3)	None	10 mg/m^3
	1-Hour	35 ppm (40 mg/m^3)		40 mg/m^3
Nitrogen Dioxide (NO_2)	Annual Average	0.053 ppm (100 µg/m^3)	Same as Primary Standard	100 µg/m^3
Sulfur Dioxide (SO_2)	Annual Average	80 µg/m^3 (0.03 ppm)	-	80 µg/m^3 (0.03 ppm)
	24-Hour	365 µg/m^3 (0.14 ppm)	-	365 µg/m^3 (0.14 ppm)
	3-Hour	-	1,300 µg/m^3 (0.5 ppm)	1,300 µg/m^3 (0.5 ppm)
Suspended Particulate Matter (PM_{10})	24-Hour	150 µg/m^3	Same as Primary Standard	150 µg/m^3
	Annual Arithmetic Mean	-		50 µg/m^3
Fine Particulate Matter ($PM_{2.5}$)	24-Hour	35 µg/m^3	Same as Primary Standard	35 µg/m^3
	Annual Arithmetic Mean	15 µg/m^3		15 µg/m^3
Lead (Pb)	Calendar Quarter	1.5 µg/m^3	Same as Primary Standard	1.5 µg/m^3

The following notes apply.

NAAQS (other than O_3, particulate matter, and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year. The O_3 standard is attained when the fourth highest 8-hour concentration in a year, averaged over 3 years, is equal to or less than the standard. For PM_{10}, the 24-hour standard is attained when 99 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. For $PM_{2.5}$, the 24-hour standard is attained when 98 percent of the daily concentrations, averaged over 3 years, are equal to or less than the standard. There are both primary and secondary NAAQS:

National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.

National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

Source: 40 C.F.R. Part 50; 18 Alaska Administrative Code, Section 50.010, Ambient Air Quality Standards.

Air pollutants or pollutant precursors are released into the atmosphere (emitted) by air pollutant sources. Pollutant emissions contribute to the ambient air concentrations of criteria pollutants, either by directly affecting the pollutants in the ambient air or by reacting in the atmosphere to form criteria pollutants. Pollutants such as CO, SO_2, lead, and some particulates that are released directly into the atmosphere by emission sources are primary pollutants. Criteria pollutants such as O_3, NO_2, and some particulates are secondary pollutants formed through atmospheric chemical reactions that are influenced by meteorology, ultraviolet light, and other atmospheric processes. Air pollutants that lead to formation of secondary pollutants are termed precursor pollutants.

For example, reactive organic gases (ROG) and oxides of nitrogen (NO_x) are precursors of O_3. In general, emissions of precursors are monitored and regulated to control the ambient levels of their associated criteria pollutants. PM_{10} and $PM_{2.5}$ are primary pollutants emitted by various mechanical processes (e.g., abrasion, erosion, mixing, or atomization) or combustion processes. PM_{10} and $PM_{2.5}$ also can be formed as secondary pollutants by chemical reactions or by condensation of gaseous pollutants into fine aerosols.

Noncriteria air pollutants that can affect human health are categorized as hazardous air pollutants (HAPs) under Section 112 of the CAA. USEPA has identified 188 HAPs. Examples of HAPs include benzene, which is found in gasoline; perchloroethylene, which is emitted from some dry cleaning facilities; and methylene chloride, which is used as a solvent and paint stripper in some industries. HAPs are regulated under the CAA's National Emission Standards for Hazardous Air Pollutants, which apply to specific sources of HAPs, and under the Urban Air Toxics Strategy, which applies to area sources.

3.1.2.3 Approach to Analysis

The air quality impact evaluation requires two separate analyses. Effects of air pollutants emitted by Navy training in the GOA in U.S. territorial seas (i.e., within 12 nm [22 km] of the coast) are assessed under NEPA. Environmental effects of air pollutants emitted by Navy training activities outside of U.S. territorial seas in the GOA (namely those that occur in the TMAA) are evaluated under EO 12114. Waters within 3 nm (5.6 km) of the State are within the jurisdiction of the ADEC; portions of the GOA that lie more than 3 nm (5.6 km) from the coastline are not in any State air quality jurisdiction.

For assessing health-based air quality effects under NEPA, all training activities where aircraft, missiles, or targets operate at or below 3,000 feet (ft) (914 meters [m]) above ground level (AGL) or that involve vessels in U.S. territorial seas were included in the emissions estimates. For assessing health-based air quality effects under EO 12114, only those training activities where aircraft, missiles, or targets operate at or below 3,000 ft (914 m) AGL or that involve vessels outside of U.S. territorial seas were considered in the evaluation. Emissions that do or would occur above 3,000 ft (914 m) AGL are considered to be above the atmospheric inversion layer and, therefore, have no effect on air quality at the earth's surface (USEPA 1995, USEPA 1992). Because the only elements of Navy training in the GOA that occur within 12 nm (22 km) of the coast are aircraft overflights above 3,000 ft (914 m) AGL, a detailed air quality analysis was prepared only for EO 12114 compliance. For assessing effects on global climate change, however, all emissions of GHG from aircraft and vessel activities in the GOA were included because GHG emissions at altitudes above 3,000 ft AGL do have an effect.

The air quality analysis involves estimating the amounts of criteria air pollutants and HAPs emitted by the proposed activities and assessing their potential impacts on air quality. Trace amounts of HAPs would be emitted by combustion sources and ordnance. Potentially hazardous air pollutants, such as rocket motor exhaust and unspent missile fuel vapors, are emitted during missile and target operations. These pollutants would have no adverse effects because of their negligible emissions rates and their distance from potentially sensitive receptors. A quantitative evaluation of HAP emissions is thus not warranted.

The Proposed Action does not include training activities in nonattainment areas, so CAA General Conformity Analysis pursuant to the General Conformity Rule (40 C.F.R. Part 93, Subpart B) is not required. In addition, the General Conformity Rule does not apply to activities outside of U.S. territorial seas because the CAA does not apply to actions outside of the United States. The estimation of pollutants and assessment of potential effects on air quality outside of U.S. territorial seas is performed through the EO 12114 analysis.

Data for the air quality analysis are based, wherever possible, on information from the GOA participants and training requirements. These data were used to estimate the numbers and types of aircraft, surface ships and vessels, submarines, and ordnance that would be involved in training activities under each alternative. Each of these project elements is a potential source of air emissions. Emissions sources and the approach used to estimate emissions under the No Action Alternative (baseline), Alternative 1, and Alternative 2 are presented below.

Emissions Estimates

Aircraft Activities

To estimate aircraft emissions, the operating modes, number of hours of operation, and type of engine for each type of aircraft were evaluated. Aircraft flights are assumed to originate from aircraft carriers offshore. All aircraft are assumed to travel to and from training ranges at or above 3,000 ft (914 m) AGL and, therefore, their transits to and from the ranges do not affect surface air quality. Air Combat Maneuvers (ACM) and Air-to-Air Missile Exercise (A-A MISSILEX) are conducted at altitudes well in excess of 3,000 ft (914 m) AGL and, therefore, are not included in the estimated emissions of criteria air pollutants. All other training activities (Table 3.1-2) are included in the emissions estimates.

The types of aircraft used and the numbers of sorties flown under the No Action Alternative, which include both Navy and U.S. Air Force aircraft, are derived from historical data. For Alternatives 1 and 2, estimates of future aircraft sorties were based on evolutionary changes in the Navy's force structure and mission assignments. Where there were no major changes in types of aircraft, future activity levels were estimated from the distribution of baseline activities.

Time on range (activity duration) under the No Action Alternative was calculated from average times derived from range records. To estimate time on range for each aircraft activity in Alternatives 1 and 2, an average duration was extrapolated from the baseline data. Estimated altitudes of activities for all aircraft were obtained from aircrew members in operational squadrons.

Air pollutant emissions were estimated based on the Navy's Aircraft Environmental Support Office (AESO) Memorandum Reports for individual aircraft categories (Aircraft Emission Estimates: Mission Operations). For aircraft for which AESO emission factors were not available (such as the Learjet aircraft), emission factors were obtained from other published sources.

Surface Ship Activities

Marine vessel traffic in the TMAA includes military ship and boat traffic, including support vessels providing services for military training activities. A number of non-military commercial vessels and recreational vessels also are regularly present in the GOA. These vessels were not evaluated in the air quality analysis because they are not part of the Navy's Proposed Action. The methods for estimating marine vessel emissions involve evaluating the type of activity, the number of hours of operation, the type of propulsion, and the type of onboard generator for each vessel type.

The types of surface ships and numbers of operations for the No Action Alternative are derived from participant data. For Alternatives 1 and 2, estimates of future ship activities were based on anticipated evolutionary changes in the Navy's force structure and mission assignments. Where there were no major changes in types of ships, estimates of future activities were based on the historical distribution of ship operations.

Table 3.1-2: Emission Sources by Training Activity

Training Activity	Emissions Source			
	Aircraft	Vessel	Ordnance	Target/ Flare
Anti-Air Warfare (AAW)				
1 - Aircraft Combat Maneuvers (ACM)	X			
2 - Air Defense Exercise (ADEX)	X	X		
3- Surface-to-Air (S-A) Missile Exercise (MISSILEX)		X	X	X
4 - Surface-to-Air Gunnery Exercise (GUNEX)		X	X	X
5 - Air-to-Air MISSILEX	X		X	X
Anti-Surface Warfare (ASUW)				
6 - Visit, Board Search and Seizure (VBSS)	X	X		
7 - Air-to-Surface MISSILEX	X			
8 - Air-to-Surface Bombing Exercise (BOMBEX)	X		X	X
9 - Air-to-Surface GUNEX	X		X	X
10 - Surface-to-Surface GUNEX		X	X	X
11 - Maritime Interdiction (MI)	X	X		
12 - Sea Surface Control (SSC)	X	X		
13 – Sinking Exercise (SINKEX)	X	X	X	X
Anti-Submarine Warfare(ASW)				
14 - ASW Tracking Exercise (TRACKEX) - Helicopter	X			X
15 - ASW TRACKEX – Marine Patrol Aircraft (MPA)	X			X
16 - ASW TRACKEX- Extended Echo Ranging (EER)	X			X
17 - ASW TRACKEX - Surface Ship		X		X
18 - ASW TRACKEX - Submarine		X		X
Electronic Combat (EC)				
19 - EC Exercises	X	X		
20 - Chaff Exercises	X	X		X
21 - Counter-Targeting Exercises	X	X		
Naval Special Warfare (NSW)				
22 - NSW Training	X	X		
Strike Warfare (STW)				
23 - Air-to-Ground BOMBEX	X		X	X
24 - Personnel Recovery (PR)	X	X		X
Support Operations				
25 - Deck Landing Qualifications (DLQ)	X	X		

For surface ships, the durations of activities were estimated by taking an average over the total number of activities for each type of training. Emissions for baseline activities and for future activities were estimated on the basis of discussions with exercise participants. In addition, information provided by participants was used to develop a breakdown of time spent at each power level used during activities in which marine vessels participated.

Emission factors for marine vessels were obtained from the database developed for Naval Sea Systems Command (NAVSEA) by JJMA Consultants (JJMA 2001). Emission factors were provided for each marine vessel type and operational mode (i.e., power level). The resulting calculations provided information on the time spent at each power level in each part of the TMAA, emission factors for that power level (in pounds [lb] of pollutant per hour), and total emissions for each marine vessel for each operational type and mode.

Submarine Activities

No U.S. submarines burn fossil fuel under normal operating conditions, so no air pollutants are emitted by their training activities.

Naval Gunfire and Missile Ordnance

Naval gunfire, missiles, bombs, and other types of ordnance used in training activities emit air pollutants. To estimate the amounts of air pollutants emitted by ordnance during its use, the numbers and types of ordnance used in each training activity were first totaled. Then generally accepted emissions factors for criteria air pollutants were applied to the total amounts. Finally, the total amounts of air pollutants emitted by each ordnance type were summed to produce total amounts of each criteria air pollutant under each alternative.

Summary of Proposed Action Emission Sources

Table 3.1-2 identifies potential sources of air pollutants for training activities included in the Proposed Action.

3.1.2.4 No Action Alternative

Criteria Air Pollutants

Table 3.1-3 lists criteria air pollutant and precursor emissions in the TMAA by general source category under the No Action Alternative. The air pollutant emitted in the greatest quantity is CO; most of the CO emitted under the No Action Alternative is from Air-to-Surface Bombing Exercise (BOMBEX). Most of the NO_x emissions are from vessel and aircraft activities.

Table 3.1-3: Annual Air Pollutant Emissions under the No Action Alternative

Emission Source	Emissions, tons/year				
	CO	NO_x	HC	SO_x	PM_{10}
Aircraft	3.4	4.2	0.3	0.2	2.7
Marine Vessel	11.3	8.0	1.2	5.9	1.1
Ordnance	1.5	0.0	0.0	0.0	0.0
Total	**16.2**	**12.2**	**1.5**	**6.1**	**3.8**

Notes: HC=hydrocarbons

Under the No Action Alternative, the annual numbers of Navy training activities in the TMAA will remain at baseline levels. Emissions rates will remain constant for those pollutant sources that are not affected by other federal, state, or local requirements to reduce air emissions. Pollutants emitted in the TMAA may be transported ashore, possibly affecting air basins in southern and southeastern Alaska. The contributions of air pollutants generated in the TMAA to the air quality in Alaskan air basins are minor compared to the contributions of existing onshore emission sources because of the distances these offshore pollutants are transported and their substantial dispersion during transport.

Table 3.1-3 shows the total amounts of regulated air pollutants under the No Action Alternative generated by Navy training activities in the TMAA. Considering the low level of air pollutants emitted under the No Action Alternative and the pollutant dispersion that normally occurs during long-range transport, these sources will not substantially affect air quality in the closest State of Alaska air basins. Ambient concentrations of criteria air pollutants in Alaskan air basins will not change under the No Action Alternative.

Hazardous Air Pollutants

The USEPA has listed 188 HAPs that are regulated under Title III (Hazardous Air Pollutants), Section 112(g) of the CAA. HAPs are emitted by several processes associated with the No Action Alternative, including fuel combustion and ordnance detonations. Trace amounts of HAPs are emitted by combustion sources participating in GOA training activities, including aircraft, marine vessels, ground vehicles, ground support equipment, and ordnance. The amounts of HAPs emitted are small compared to the emissions of criteria pollutants; emission factors for most HAPs from combustion sources are roughly three or more orders of magnitude lower than emission factors for criteria pollutants (California Air Resource Board 2007). Emissions of HAPs from ordnance use are smaller still, with emission factors ranging from roughly 10^{-5} to 10^{-15} lb of individual HAP per item for cartridges to 10^{-4} to 10^{-13} lb of individual HAPs per item for mines and smoke canisters (USEPA 2006). The amounts of HAP emissions are roughly proportional to the amounts of criteria air pollutants emitted.

HAP emissions will be distributed over the entire range, and their concentrations will be further reduced by atmospheric mixing and other dispersion processes. Most of the training activities will occur 12 nm (22 km) or more offshore, where no sensitive receptors (i.e., residents, schools, hospitals, etc.) are located, so no health effects are anticipated from emissions of HAPs in the TMAA. Therefore, HAP emissions for the Proposed Action will not be quantitatively estimated in this EIS.

3.1.2.5 Alternative 1

Criteria Air Pollutants

Table 3.1-4 lists the estimated criteria air pollutant and precursor emissions in the TMAA under Alternative 1 by general source category. The air pollutant that would be emitted in the greatest quantity is CO; most of the CO emitted under Alternative 1 would be from Air-to-Surface BOMBEX. Most of the NO_x emissions would be from vessel and aircraft activities. Other than CO from live bombs, ordnance would be an insignificant source of air pollutants.

Table 3.1-4: Annual Air Pollutant Emissions under Alternative 1

Emission Source	Emissions, tons/year				
	CO	NO_x	HC	SO_x	PM_{10}
Aircraft	4.1	6.4	0.4	0.4	3.9
Marine Vessel	12.4	8.8	1.3	6.3	1.2
Ordnance	2.2	0.0	0.0	0.0	0.0
Total	**18.7**	**15.2**	**1.7**	**6.7**	**5.1**
Increase Over No Action Alternative	**2.5**	**3.0**	**0.2**	**0.6**	**1.3**

Under Alternative 1, the annual numbers of various Navy training activities in the TMAA would increase by about 12 percent. Criteria air pollutants would increase slightly, with the largest increases in emissions of CO (2.5 tons per year [TPY]) and NO_x (3.0 TPY). Pollutants emitted in the TMAA may be transported ashore, possibly affecting air basins in southern and southeastern Alaska. The contributions of air pollutants generated in the TMAA to the air quality in terrestrial air basins are minor, however, compared to the contributions of existing onshore emission sources because of the distances these offshore pollutants are transported and their substantial dispersion during transport.

Considering the low level of air pollutants emitted under Alternative 1 and the pollutant dispersion that normally occurs during long-range transport, these sources will not substantially affect the State's air quality. Ambient concentrations of criteria air pollutants in Alaskan air basins will not change under Alternative 1.

Hazardous Air Pollutants

Trace amounts of HAPs are emitted from sources participating in Alternative 1 activities, including aircraft, marine vessels, and ordnance. As noted for the No Action Alternative in Section 3.1.2.4, HAP emissions are not quantitatively estimated, but the increase in HAP emissions under Alternative 1 would be roughly proportional to the increase in emissions of criteria air pollutants. Therefore, the amounts that would be emitted as a result of Alternative 1 activities would be somewhat greater than those emitted under the No Action Alternative, but would remain very small compared to the emissions of criteria air pollutants.

HAP emissions will be distributed over the entire range, would rapidly disperse, and would be diluted through mixing in the atmosphere to a much lower ambient concentration. Most of the training activities would occur 12 nm (22 km) or more offshore, where no sensitive receptors (i.e., residents, schools, hospitals, etc.) are located, so no health effects would result from emissions of HAPs in the TMAA under Alternative 1.

Summary

Training activities in the TMAA under Alternative 1 would emit air pollutants for a few weeks per year. Air pollutant emissions under Alternative 1 would increase relative to the baseline (No Action Alternative) emissions. Air pollutant emissions from training activities would be released to the environment in a remote area with good ventilation and few existing sources of air pollutants. Training emissions would be rapidly dispersed over a large ocean area where few individuals would be exposed to them. Residual air pollutant effects during the large portion of the year when training was not being conducted would be negligible. Based on the estimated levels of air pollutant emissions presented in Table 3.1-4, no substantial air pollutant effects are expected under Alternative 1.

3.1.2.6 Alternative 2

Criteria Air Pollutants

Under Alternative 2, the annual numbers of various Navy training activities in the TMAA would increase by about 123 percent from No Action Alternative (baseline) levels. Air pollutant emissions rates also would increase relative to emissions under the No Action Alternative. Table 3.1-5 lists the estimated criteria air pollutant and precursor emissions in the TMAA by general source category under Alternative 2. The air pollutant that would be emitted in the greatest quantity is CO (27.4 TPY). Most of the CO emitted under Alternative 1 would be from Air-to-Surface BOMBEX, the annual number of which would double under Alternative 2. Under Alternative 2, CO emissions from vessel and aircraft operations in the open ocean (more than 12 nm [22 km] from land) also would increase. Most of the NO_x emissions (22.6 TPY) would be from vessel and aircraft activities, and these emissions also would increase relative to baseline emissions. Other than CO from live bombs, ordnance would be an insignificant source of air pollutants.

Table 3.1-5: Annual Air Pollutant Emissions under Alternative 2

Emission Source	Emissions, tons/year				
	CO	NO_x	HC	SO_x	PM_{10}
Aircraft Operations	8.0	12.5	0.9	0.7	7.6
Marine Vessel Operations	24.8	17.5	2.5	12.3	2.3
Ordnance	4.5	0.0	0.0	0.0	0.0
SINKEX	6.3	4.8	0.5	1.2	0.9
Total	**43.6**	**34.8**	**3.9**	**14.2**	**10.8**
Increase Over No Action Alternative	**27.4**	**22.6**	**2.4**	**8.1**	**7.0**

Pollutants emitted in the TMAA may be transported ashore, possibly affecting air basins in southern and southeastern Alaska. The contributions of air pollutants generated in the TMAA to the air quality in terrestrial air basins are minor, however, compared to contributions from existing onshore emission sources because of the distances these offshore pollutants are transported and their substantial dispersion during transport.

The criteria air pollutants emitted under Alternative 2 would be distributed over a large, well-ventilated area, where their effects on ambient air pollutant concentrations would be minor. Due to the air pollutant dispersion that normally occurs during long-range transport, these sources will not substantially affect the State's air quality. Ambient concentrations of criteria air pollutants in Alaskan air basins will not change under Alternative 2.

Hazardous Air Pollutants

Trace amounts of HAPs are emitted from sources participating in Alternative 2 activities, including aircraft, marine vessels, and ordnance. As noted for the No Action Alternative in Section 3.1.2.4, HAP emissions are not quantitatively estimated, but the increase in HAP emissions under Alternative 2 would be roughly proportional to the increase in emissions of criteria air pollutants. Therefore, the amounts emitted as a result of Alternative 2 activities would be greater than those emitted under the No Action Alternative, but would remain small compared to the estimated emissions of criteria air pollutants under Alternative 2.

HAP emissions will be distributed over the entire range, would rapidly disperse, and would be diluted through mixing in the atmosphere to a much lower ambient concentration. Most of the training activities would occur 12 nm (22 km) or more offshore, where no sensitive receptors (i.e., residents, schools, hospitals, etc.) are located, so no health effects would result from emissions of HAPs in the TMAA under Alternative 1.

SINKEX

Alternative 2 would include SINKEX, in which several aircraft and vessels fire various types of ordnance at a ship hulk until it sinks. Estimated criteria air pollutant emissions from this activity are shown in Table 3.1-5. SINKEX would generate a substantial portion of the total air pollutants emitted under Alternative 2.

Summary

Training activities in the TMAA under Alternative 2 would emit air pollutants for a few weeks per year. The increase in air pollutant emissions under Alternative 2 would represent an increase in air pollutant emissions relative to the baseline (No Action Alternative) emissions. Air pollutant emissions from training activities would be released to the environment in a remote area with good ventilation and few other existing sources of air pollutants. Training emissions would be rapidly dispersed over a large ocean area where few individuals would be exposed to them. Residual air pollutant effects during the large portion of the year when training was not being conducted would be negligible. Based on the estimated levels of air pollutant emissions presented in Table 3.1-5, no substantial air pollutant effects are expected under Alternative 2.

3.1.3 Mitigation

As described in Sections 3.1.2.4 to 3.1.2.6, annual emissions of criteria and hazardous air pollutants produced by the Proposed Action are well below a level that could degrade regional air quality. Therefore, no mitigation measures are required to reduce the impacts on the environment of air emissions from the Proposed Action.

3.1.4 Summary of Effects

Table 3.1-6 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on air quality under both NEPA and EO 12114.

Table 3.1-6: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to air quality would occur. • Overflights of ocean (0-12 nm) and land areas at altitudes above 3,000 ft AGL would not affect ground-level air quality.	• The No Action Alternative would maintain training activities and associated air pollutant emissions at baseline levels outside of U.S. territory.
Alternative 1	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to air quality would occur. • Overflights of ocean (0-12 nm) and land areas at altitudes above 3,000 ft AGL would not affect ground-level air quality.	• Outside of U.S. territory, air pollutant emissions would increase slightly, mainly from increased surface vessel and aircraft activities. • Although Alternative 1 would increase emissions of air pollutants over the No Action Alternative, emissions outside of U.S. territorial seas would not cause an air quality standard to be exceeded.
Alternative 2 (Preferred Alternative)	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to air quality would occur. • Overflights of ocean (0-12 nm) and land areas at altitudes above 3,000 ft AGL would not affect ground-level air quality.	• Outside of U.S. territory, air pollutant emissions would increase mainly from increased surface vessel and aircraft activities. • SINKEX would generate a substantial portion of the air pollutants that would be emitted under Alternative 2. • Although Alternative 2 would increase emissions of air pollutants over the No Action Alternative, emissions outside of U.S. territorial seas would not cause an air quality standard to be exceeded.

3.2 Expended Materials

3.2 EXPENDED MATERIALS

3.2.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for expended materials is the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). With the exception of Cape Cleare on Montague Island located over 12 nautical miles (nm) (22 kilometers [km]) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm offshore. Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999) and the *Transformation of U.S. Army Alaska FEIS* (Army 2004). These documents analyzed Navy training activities in the inland GOA training lands, and provide analyses of baseline conditions and future levels of training activities. Training activities on the inland training lands under the No Action Alternative, Alternative 1, and Alternative 2 for this EIS are within the scope of those estimates.

3.2.1.1 Expended Materials

This section addresses expended materials, both hazardous and nonhazardous, that result from Navy training activities in the TMAA. Definitions in this section are not based on a specific regulation, such as the Resource Conservation and Recovery Act (RCRA). For this analysis, definitions incorporate information from several environmental laws and regulations for hazardous materials. Hazardous materials addressed in this document are broadly defined as substances that pose a substantial hazard to human health or the environment by virtue of their chemical or biological properties. Hazardous materials may be solid, liquid, semi-solid, or gaseous materials that alone or in combination may 1) cause or contribute to an increase in mortality or illness; or 2) pose a substantial present or potential hazard to human health or the environment when improperly applied, handled, treated, stored, transported, or disposed. In general, the degree of hazard posed by these materials is related to their quantity, concentration, bioavailability, or physical state. Hazardous materials are regulated under a variety of federal and state laws (see Section 3.2.2, Environmental Consequences).

In this section, the phrase "hazardous materials" refers collectively to hazardous materials, hazardous wastes, and individual components and constituents of larger objects or processes (e.g., missile warheads and fuel) that may be hazardous. Hazardous materials often are used in small amounts in high-technology weapons, ordnance, and targets because they are strong, lightweight, reliable, long lasting, or low cost. For this analysis, hazardous constituents are defined as components of expended materials that may contain hazardous materials or substances. Nonhazardous expended materials are defined as parts of a device that are made of nontoxic metals (e.g., steel, iron, aluminum), polymers (e.g., nylon, rubber, vinyl, and various other plastics), glass, fiber, or concrete. Sources of these non-hazardous materials include bombs, shells, and targets. A portion of these non-hazardous items represent persistent seabed litter but, because of their strong resistance to degradation and their chemical composition, they do not chemically contaminate the surrounding environment by leaching heavy metals or organic compounds.

Open ocean areas are typically considered to be relatively pristine with regard to hazardous substances. Hazardous substances are anthropogenic sources of material that could negatively affect the marine and land environment, and organisms inhabiting those environments. Hazardous substances are present in varying concentrations in marine waters and sediments from past activities such as ocean dumping, military activities (e.g., bombing ranges during World War II), commercial activities, and chemical spills.

No information is available, however, on the types and quantities of hazardous substances present in the TMAA.

Table 3.2-1 provides information on the types of training items used in the TMAA that may contain hazardous constituents. All training materials listed therein will be used under the No Action Alternative, except for training materials used in Anti-Submarine Warfare (ASW) exercises. The potential environmental effects of expended Navy training materials are primarily associated with the toxicity of hazardous constituents to marine biota. Hazardous materials may be contained in several components of expended materials, including outer casings, propellants, batteries, explosives, and pyrotechnics.

Hazardous Materials

Heavy Metals

Some metals are necessary for biological organisms to function properly, such as iron, zinc, copper, and manganese in humans. Heavy metals commonly of concern include lead, cadmium, mercury, and chromium. Zinc, copper, and manganese also may be of concern when exposure levels are high. In the GOA study area, heavy metals are present in manned and unmanned aircraft, bombs, shells, missiles, bullets, sonobuoys, batteries, electronic components, and anticorrosion compounds coating exterior surfaces of ordnance, including missiles, small-caliber rounds, torpedoes, and bombs. Most of these materials are inert and dense, and will settle to the bottom. There they will eventually be covered by sediment, coated by chemical processes (e.g., corrosion), or encrusted by marine organisms (e.g., barnacles).

Propellants

Hazardous chemicals include fuels and other propellants, and combustion byproducts of those fuels and propellants. These materials are present or may be generated by the use of aircraft, vessels, ordnance, and unmanned aircraft. Toxic components of fuel oils include aromatic hydrocarbons, such as benzene, toluene, and xylene, and polycyclic aromatic hydrocarbons such as naphthalene, acenaphthene, and fluoranthene. Like commercial and recreational watercraft, Navy boat engines discharge petroleum products in their wet exhaust.

In general, the single largest hazardous constituent of missiles is solid propellant, such as solid double-base propellant, aluminum and ammonia propellant grain, and arcite propellant grain. The solid propellant is primarily composed of rubber (polybutadiene) mixed with ammonium perchlorate. In general, a surface-to-air missile typically consumes 99 to 100 percent of its propellant when it functions properly (Department of the Navy [DoN] 2009). Hazardous constituents, such as plastic-bonded explosives (PBX) high-explosive (HE) components, PBX-106 explosive, and PBX (AF)-108 explosive, are also used in igniters, explosive bolts, batteries (potassium hydroxide and lithium chloride), and warheads.

Explosives

Explosives are used in live bombs, spotting charges for training rounds, missiles, and sonobuoys. Ordnance constituents of concern include nitroaromatics—principally trinitrotoluene (TNT), its degradation products, and related compounds and cyclonitramines, including Royal Demolition Explosive (RDX, cyclotrimethylene trinitramine), High Melting Explosive (HMX, cyclotetramethylene tetranitramine), and their degradation products. Most new military explosives are mixtures of plastic or other polymer binders, RDX, and HMX. Pentaerythritoltetranitrate (PETN) is used in blasting caps, detonation cord, and similar initiators of explosions. When live ordnance functions properly, 99.997 percent of the explosives contained therein are converted to inorganic compounds (U.S. Army Corps of Engineers [USACE] 2003).

Explosives become a concern when ordnance does not function correctly, and fails to detonate (failure) or detonates incompletely (low-order detonation). In these cases, all or a portion of the explosive remains unconsumed. Table 3.2-2 provides the failure and low-order detonation rates of various ordnance items.

Table 3.2-1: Hazardous Constituents of Expendable Training Materials, by Training Item

Training Item		Hazardous Constituent				
		Heavy Metal	Propellant	Battery	Explosive	Pyrotechnic
Missiles	AIM-7 Sparrow missile	✓	✓	✓	✓	
	AIM-9 Sidewinder missile	✓	✓	✓	✓	
	AIM-120 Advanced Medium-Range Air-to-Air Missile (AMRAAM)	✓	✓	✓	✓	
	Standard Missile-1	✓	✓	✓	✓	
	AGM-65 Maverick	✓	✓	✓	✓	
	AGM-84 Harpoon	✓	✓	✓	✓	
	AGM-84K Standoff Land Attack Missile – Expanded Response (SLAM-ER)	✓	✓	✓	✓	
	AGM-88 High Speed Anti-Radiation Missile (HARM)					
	AGM-114 Hellfire	✓	✓	✓	✓	
	AGM-119 Penguin					
Bombs	BDU-45 Practice (inert)[2]	✓			✓	
	MK-82 500-pound (lb) bomb (192.2 Net Explosive Weight [NEW]), HE[3]	✓			✓	
	MK-83 1,000-lb bomb (415.8 NEW), HE[3]	✓			✓	
	MK-84 2,000-lb bomb (944.7 NEW), HE[3]	✓			✓	
Naval Gun Shells	5"/54-caliber (cal) gun shell (inert)	✓	✓			
	5”/54-cal gun shell (live)	✓	✓		✓	
	76- millimeter (mm) gun shell (inert)	✓	✓			
	76-mm gun shell (live)	✓	✓		✓	
	57-mm gun shell	✓	✓		✓	
	25-mm gun shell	✓				
	20-mm gun shell	✓				
Small Arms Rounds	0.50-cal machine gun	✓	✓			
	7.62-mm projectile	✓	✓			
Targets and Pyrotechnics	BQM-74E unmanned aerial target[5]	✓		✓		
	LUU-2B paraflare[1]	✓				✓
	MK-58 Marine Marker[1]	✓				✓
	MK-39 Expendable Mobile Anti-Submarine Warfare Training Target (EMATT)	✓		✓		
Sonobuoys	SSQ-36 Bathythermograph (BT)	✓		✓		
	SSQ-53 Directional Frequency Analysis and Recording (DIFAR)	✓		✓		
	SSQ-62 Directional Command Activated Sonobuoy System (DICASS)	✓		✓		
	SSQ-77 Vertical Line Array Directional Frequency Analysis and Recording (VLAD)	✓		✓		
	SSQ-110A Extended Echo Ranging (EER)	✓		✓	✓	
Torpedoes	MK-48 Advanced Capability (ADCAP) torpedo	✓	✓	✓	✓	
Chaff	ALE-43 Dispenser (Aluminized glass roll)[4]				✓	

Notes: (1) target not recovered, (2) may contain a spotting charge, (3) lb in terms of total weight, (4) chaff is deployed using an explosive charge, (5) target recovered. Training materials that do not contain hazardous materials are not included

Table 3.2-2: Failure and Low-Order Detonation Rates of Military Ordnance

Ordnance	Failure Rate (Percent)	Low-Order Detonation Rate (Percent)
Guns / artillery	4.68	0.16
Hand grenades	1.78	n/a
High-explosive ordnance	3.37	0.09
Rockets	3.84	n/a
Submunitions	8.23	n/a

Source: Rand 2005

These materials can release small amounts of hazardous substances into the water or sediment as they degrade and decompose. Table 3.2-3 provides a list of hazardous constituents typically present in components of expended training materials.

Table 3.2-3: Hazardous Constituents of Training Materials, by Component

Training Application/Ordnance Element	Hazardous Constituent
Casings, assemblies, projectiles	Chromium Lead Tungsten Nickel Cadmium
Pyrotechnics Tracers Spotting charges	Barium chromate Potassium perchlorate Chlorides Phosphorus Titanium compounds
Oxidizers	Lead oxide
Delay elements	Barium chromate Potassium perchlorate Lead chromate
Propellants	Ammonium perchlorate
Fuses	Potassium perchlorate
Detonators	Fulminate of mercury Potassium perchlorate
Primers	Lead azide

Source: USACE 2007

Pyrotechnics

Pyrotechnic materials are used in pyrotechnic devices such as flares and markers. Hazardous pyrotechnic materials include magnesium and white and red phosphorus, which do not explode, but burn at high temperatures once ignited. Metals such as barium, sodium, nickel, and titanium are often incorporated into pyrotechnic materials to produce specific visual characteristics, such as color, smoke, or both. Perchlorates may be used as oxidizers and to enhance the visual characteristics of the item. Residues from pyrotechnic items that function as designed include metallic compounds and residual perchlorate compounds. Pyrotechnic items also may include igniters and fuses.

Fates of Expended Materials

Expended training materials that come to rest on the ocean floor may:

1) Lodge in oxygen-poor sediments (DoN 2008c);
2) Remain on the ocean floor and corrode; or
3) Remain on the ocean floor and become encrusted by marine organisms.

Rates of deterioration depend on the material and on the conditions in the immediately surrounding marine and benthic environment. Materials buried deep in ocean sediments tend to decompose at much lower rates than when exposed to seawater. With the exception of sonobuoy parts (see Sonobuoys later in this section), sediment burial appears to be the fate of most ordnance used in marine warfare.

Metals exposed to seawater generally begin to oxidize (corrode). The rate at which corrosion occurs depends on many environmental factors, including temperature (Bayliss et al. 1988). An increase in water temperature increases the rate of metal corrosion. In cold waters like GOA, the cold waters reduce the rate of corrosion. Although materials take longer to break down, the rate of leaching from metals is also decreased.

This process creates a layer of corroded material around the object. This corrosion layer isolates the parent material from the corrosive seawater, a process that further slows movement of the metals into the adjacent sediments and the water column. In a similar fashion, as materials become covered by marine organisms, the direct exposure of the material to seawater decreases and the rate of corrosion decreases. Dispersal of these materials in the water column is controlled by physical mixing and diffusion, both of which tend to vary with time and location. A recent study of similar Canadian military operations in the Strait of Georgia concluded that, in general, the direct impact of expended material accumulation on the ocean floor appeared to be minimal, and had no detectable effects on wildlife or sediment quality (Canadian Forces Maritime Experimental and Test Ranges [CFMETR] 2005).

Studies at historic, deep-water munitions sea disposal sites have found minimal effects on the ocean environment from discarded military munitions (Bauer and Kendall 2010; National Defense Center for Energy and Environment 2010). Sampling from the Hawaii Undersea Military Munitions Assessment (National Defense Center for Energy and Environment 2010) focused on several aspects of expended military munitions, including whether munitions constituents could be detected near expended military materials, whether there were statistically different munitions constituent levels in sediment near expended materials compared to reference control sites, and whether munitions constituents posed an unacceptable risk to human health. In 159 samples (consisting of sediment, water, fish, and shrimp), no explosive material was detected. Elevated levels of arsenic and lead were found in a few biota samples, but the origin of those metals could not be tied to a specific source. Comparison of sediments from expended military materials sites to reference control sites did not show statistically significant differences in levels of munitions constituents. In addition, observations and data did not indicate any adverse effects on ecological health or risk to human health from consumption of organisms collected in the study area (National Defense Center for Energy and Environment 2010).

In general, ordnance constituents appear to pose little risk to the marine environment. Military-grade explosives generally have low water solubility, so they do not readily dissolve in water and are, therefore, relatively immobile in water (Table 3.2-4). The degradation and dissolution of these materials are slowed by the physical structure and composition of blended explosives, which contain several chemical compounds, often with additional binding agents. Ordnance constituents of concern include nitroaromatics—principally TNT, its degradation products, and related compounds and cyclonitramines, including RDX, HMX, and their degradation products. TNT degrades to dinitrotoluene (DNT) and to subsequent degradation products by bacterial activity (biodegradation). RDX is subject to photolysis and biodegradation once exposed to the environment.

Table 3.2-4: Water Solubility of Common Explosives

Compound	Water Solubility*
Salt (sodium chloride) [for comparison]	357,000
Ammonium perchlorate	249,000
Picric acid	12,820
Nitrobenzene	1,900
Dinitrobenzene	500
Trinitrobenzene	335
DNT	160-161
TNT	130
Tetryl	51
PETN	43
RDX	38
HMX	7
White phosphorus	4

Note: * Units are milligrams per liter (mg/L) at 20 degrees Celsius.
Source: DoN 2009

Additional sources of hazardous materials are expended training materials that are not completely consumed during use, such as flares and pyrotechnics, and explosives that fail to function properly. Explosives, which are designed to be consumed during use, have a high potential of environmental contamination because duds and low-order detonations account for a large percentage of hazardous materials due to the amounts of explosives used. Ordnance failure or low-order detonation means that hazardous materials, such as propellants, explosives, and batteries, are present in greater quantities because substances are not consumed during use. Expended training materials from ordnance that functions as designed are primarily metal casings.

Bombs

Bombing exercises typically involve one or more aircraft bombing a target that simulates a hostile surface vessel at sea. Bomb casings are made of steel, with fins of steel or aluminum. Based on standards established by American Society for Testing and Materials International, each steel bomb body or fin also may contain small percentages of carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, molybdenum, vanadium, columbium, or titanium, although typically present at less than 1 percent by weight. The aluminum fins may also contain zinc, magnesium, copper, chromium, manganese, silicon, or titanium (DoN 2009). Bombs may be live or inert (so-called "practice" or "bomb dummy units"). The latter are bomb bodies filled with an inert material (e.g., concrete) and configured to have the same weight, size, center of gravity, and ballistics as a live bomb.

The main hazardous component of expended bombs is residual explosives. Most of the residual explosives result from incomplete (low-order) detonations or complete failure of the item to detonate. High-order detonations generally consume an estimated 99.997 percent of the explosives (USACE 2003). Bombs that are fail to function (i.e., "duds") deposit large amounts of unconsumed explosives. The estimated failure rate for high explosives under test conditions is 3.37 percent (see Table 3.2-2), but the failure rate during training typically is higher because of operator inexperience. Most inert bombs contain a spotting charge, which is a small amount of explosive (usually two to three pounds [lb]) used to identify the point of impact.

Missiles

Missiles are fired by aircraft and ships at a variety of airborne and surface targets. Table 3.2-5 describes the explosives and propellants used in the types of missiles that will be used in the TMAA under all of the alternatives. Missiles may contain hazardous materials as normal parts of their functional components, including igniters, explosive bolts, batteries, warheads, and solid propellants. Chemicals released during missile launches are provided in Table 3.2-6, along with their estimated maximum concentrations.

Table 3.2-5: Explosives and Propellants in Selected Missiles – No Action Alternative

Type of Missile	Type of Propellant
AIM-7 Sparrow	Propellant is dual-thrust, solid-fuel rocket motor (Hercules MK-58); warhead is an 88-lb. (40-kilogram [kg]) WDU-27/B blast-fragmentation device.
AIM-9 Sidewinder	Propulsion system contains up to 44 lb. (20 kg) of solid double-base propellant; warhead contains approximately 10 lb. (4.5 kg) of PBX HE.
AIM-120 AMRAAM	Propellant is solid-fuel rocket motor (ATK WPU-6B booster and sustainer with RS hydroxyl-terminated polybutadiene solid propellant fuel); warhead contains 40 lb. (18 kg) of HE.
RIM-67A Standard Missile-1	Propellant is a two-stage, solid-fuel rocket (MK-30 sustainer motor and a Hercules MK 12 booster); warhead contains 137 lb (62 kg) of HE.

Source: Global Security 2008f

Table 3.2-6: Chemical Compounds Associated with Missile Launches

Resource	Chemical Compound	Maximum Environmental Concentration (mg/m^3)
Air	Al_2O_3 – alumina	0.021
	CO – carbon monoxide	39.11
	HCl – hydrochloric acid	0.012
	NO_x – oxides of nitrogen	0.009
Water	Jet propulsion fuel, Type 8	0.023

Notes: (mg/m^3) = milligrams per cubic meter
Source: USAF 1999

In general, the single largest hazardous constituent of missiles is the solid propellant. Missile propellants typically contain ammonium perchlorate (NH_4ClO_4), aluminum compounds, copper, and organic lead compounds. A surface-to-air missile typically consumes 99 to 100 percent of its propellant when it functions properly (DoN 2009). The remaining solid propellant fragments (less than one percent of initial propellant weight) sink to the ocean floor and undergo physical and chemical changes in the presence of seawater. Tests show that water penetrates only 0.06 inch (in) (0.14 centimeter [cm]) into the propellant during the first 24 hours of immersion, and that fragments slowly release ammonium and perchlorate ions (Fournier 2005). These ions rapidly disperse into the surrounding seawater, so local concentrations are extremely low.

For example, a Standard Missile-1 typically has 150 lb (68 kg) of solid propellant, resulting in less than 1.5 lb (0.7 kg) of propellant residual after training exercises. Assuming that all of the propellant on the ocean floor was in the form of 4-in (10-cm) cubes, only 0.42 percent of it would be wetted during the first 24 hours of immersion. If all of the ammonium perchlorate leached out of the wetted propellant, then approximately 0.01 lb (0.003 kg) would enter the surrounding seawater (DoN 2009). The leach rate would

decrease over time as the concentration of perchlorate in the propellant declined. The aluminum in the propellant binder would eventually be oxidized by seawater to aluminum oxide. The remaining binder material and aluminum oxide would not pose a threat to the marine environment.

During aviation exercises, approximately 50 percent of missiles contain telemetry warheads (inert versions), and do not explode on contact with the target or ocean surface. Exploding warheads may be used in air-to-air missile exercises but, to avoid damaging the aerial target, the missile explodes in the air, disintegrates, and falls into the ocean. Live missiles used in air-to-surface exercises explode near the water surface. An estimated 99.997 percent of this material would be consumed in a high-order detonation. Missiles that are duds contain large amounts of unconsumed explosives, which are considered to be hazardous. The estimated failure rate for missiles is approximately the same as for bombs (3.37 percent).

Missile batteries are another possible source of contaminants. The batteries used for missiles are similar in type and size to those used for sonobuoys. Possible hazardous materials in batteries are described later in this section under Sonobuoys.

Targets

At sea, targets are usually remotely operated aerial, surface, or subsurface units, most of which are recovered for reuse. Targets and countermeasures proposed for the GOA study area are described below.

Aerial Targets

Aerial targets are used in several training warfare areas, and include targets used for both simulated and live-fire exercises. Possible expended or unrecovered targets include LUU-2B/B paraflares, Tactical Air Launched Decoy (TALDs), and BQM-74Es. LUU-2B/B and TALD targets are not recovered after training use. BQM-74E targets are normally recovered after training, but some individual BQM-74E targets may not be recovered for various reasons.

The LUU-2B/B is a flare that illuminates targets by burning magnesium at high temperature while suspended from a parachute. The LUU-2B is constructed of aluminum, and weighs about 30 lb (DoN 2001c). The flare material and portions of the assembly are usually consumed during flight (DoN 2001c). Hazardous materials in pyrotechnic compositions are discussed later in this section under Flares.

The TALD is an air-launched, gliding vehicle that emits signals to confuse air defense systems during aircraft Strike Warfare training. It is constructed of aluminum, and weighs about 400 lb (Global Security 2008a). TALDs contain two 38-volt thermal batteries, which are lost after training use. Thermal batteries may contain hazardous components similar to lithium batteries, and are discussed later in this section under Sonobuoys.

The BQM-74E is a remote-controlled, subsonic, jet-powered aerial target that can be launched from the air or surface, and recovered on land or at sea. The target generates signals for tracking purposes. It is powered by a jet engine, and thus contains oils, hydraulic fluid, batteries, and explosive cartridges. (DoN 2001b). Hazardous materials in aerial targets are mostly consumed during training use, and BQM-74E targets are recovered after training exercises, to the maximum extent possible.

Surface Targets

Surface targets are used for Anti-Surface Warfare exercises. MK-58 marine markers are pyrotechnic devices dropped on the water's surface during training exercises to mark a position on the ocean surface, primarily for Bombing Exercises. The chemical flame of a marine marker burns like a flare, but also

produces smoke. The MK-58 marine marker is a tin tube that weighs about four lb, and produces a yellow flame and white smoke for 10 to 20 minutes. It contains a red phosphorous compound that is ignited by a seawater-activated battery (DoN 1996a). MK-58 marine markers are not recovered because they are mostly consumed during use. Hazardous materials in pyrotechnic compositions are discussed later in this section under Flares.

Other surface targets used during training exercises (Killer Tomatoes and Spar Buoys) do not contain hazardous materials. Killer Tomatoes are large inflatable vinyl balloons that float on the surface of the water. Spar Buoys are tall, cylindrical buoys, typically consisting of relatively inert metals, such as aluminum or iron. These surface targets are recovered after training use, to the maximum extent possible.

Underwater Targets

The MK-39 EMATT is an air- or surface-launched unmanned target that maneuvers underwater in the ocean, and emits magnetic or acoustic signals that are monitored by aircraft and surface vessels for training (see Appendix H for physical description of EMATT). The duration of EMATT activity is about three hours, and EMATTs are not recovered after training use. EMATTs use lithium-sulfur dioxide batteries, which may contain hazardous materials. Each EMATT contains a battery pack consisting of 15 "DD" size lithium-sulfur dioxide batteries, weighing approximately 6.2 lb (2.83 kg) (Peed et al. 1988).

Lithium batteries consist of an exterior nickel-plated steel jacket, sulfur dioxide, lithium metal, carbon, acetonitrile, and lithium bromide (DoN 2008a). The chemical reaction that generates electricity proceeds nearly to completion once the cell is activated, so only limited amounts of reactants are present when the battery life terminates. Lithium and bromine naturally occur in seawater. Lithium metal is extremely reactive with water, resulting in an exothermic reaction that generates soluble hydrogen gas and lithium hydroxide. Hydrogen gas enters the atmosphere, while lithium hydroxide ultimately disassociates into lithium ions and water (DoN 2008a). Sulfur dioxide ionizes in water, forming bisulfite. Bisulfite is easily oxidized into sulfate, which is present in large quantities in the ocean.

An evaluation of lithium-sulfide dioxide batteries in the marine environment (CFMETR 2005) concluded that: "The standard lithium-sulfur dioxide battery theoretically presents little or no acute or chronic danger to the marine environment. The battery consists of seven material components, and each has been considered in terms of environmental exposure. In each case, it was determined that immersion in seawater would result in the formation of either water-soluble or chemically inert waste products. These will be infinitely dispersible and virtually unsusceptible to significant accumulation." The ocean currents would greatly diffuse concentrations of the chemicals leached by EMATT batteries within a short period. Therefore, lithium batteries would not be expected to substantially affect water quality because of the low amount of reactants remaining after use and the low concentration of leaching materials.

The implementation of a Portable Undersea Training Range (PUTR) would be included under Alternative 1 and Alternative 2. The PUTR is a portable system with the capability to score, track, and provide feedback on underwater events. The PUTR consists of seven electronics packages to be temporarily installed on the ocean floor via concrete anchors. While the electronics packages would be recovered upon completion of training exercises, the concrete anchors would remain on the ocean floor. If electronics packages were lost, batteries would be the primary source of hazardous materials, which would have effects similar to batteries used in EMATTS. Each anchor is approximately 1.5 feet (ft) by 1.5 ft (0.46 meter [m] by 0.46 m), and would weigh approximately 3,000 lb (1,364 kg). Anchors would be constructed of either concrete or sand bags. Concrete and sand would be relatively inert in the marine environment, and would be covered with sand or sediment over time.

Flares

Flares are used as targets or markers; the previous section on surface targets describes their use and composition. Hazardous constituents are typically present in pyrotechnic residues, but are bound up in relatively insoluble compounds. Solid flare and pyrotechnic residues may contain, depending on their purpose and color, an average weight of up to 0.85 lb (0.4 kg) of aluminum, magnesium, zinc, strontium, barium, cadmium, nickel, and perchlorates (DoN 2009). As inert, incombustible solids with low concentrations of leachable metals, these residues typically are not characterized as hazardous materials. The perchlorate compounds present in the residues are relatively soluble, albeit persistent in the environment, and probably disperse quickly.

Chaff

Radiofrequency chaff is an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Chaff is released or dispensed from military vehicles in cartridges or projectiles that contain millions of chaff fibers. Chaff is composed of an aluminum alloy coating on glass fibers of silicon dioxide. The coating is about 99.4 percent aluminum by weight, and contains negligible amounts of silicon, iron, copper, manganese, magnesium, zinc, vanadium, and titanium (USAF 1997). Chaff fibers are similar to a human hair in diameter and shape (USAF 1997). These aluminum-coated glass fibers (about 60 percent silica and 40 percent aluminum by weight) range in length from 0.8 to 7.5-cm, with a diameter of about 40 micrometers. For each chaff cartridge used, a plastic end-cap and Plexiglas piston are released into the environment, but these materials are not hazardous. The end-cap and piston are both round, and are 1.3 inches in diameter and 0.13 inch thick (Spargo 2007).

When chaff is deployed, a diffuse cloud of fibers undetectable to the human eye is formed. Chaff is a very light material that can remain suspended in air anywhere from 10 minutes to 10 hours. It can travel considerable distances from its release point, depending on prevailing atmospheric conditions (Arfsten et al. 2002). For example, Hullar et al. (1999) calculated that a 4.97-mile by 7.46-mile area (37.1 square miles or 28 square nautical miles [nm^2]) would be affected by deployment of a single cartridge containing 150 grams of chaff. The resulting chaff concentration would be about 5.4 grams (g) per nm^2. This concentration corresponds to fewer than 179,000 fibers per square nautical mile, or about one fiber per 200 square feet, assuming that each canister contains five million fibers.

Specific release points tend to be random, and chaff dispersion in air depends on prevailing atmospheric conditions. After falling from the air, chaff fibers would be expected to float on the ocean surface for some period, depending on wave and wind action. The fibers would be further dispersed by ocean currents as they float and slowly sink toward the bottom. The fine, neutrally buoyant chaff streamers would act like particulates in the water, temporarily increasing the turbidity of the ocean's surface, while the end caps and pistons would sink. The chaff fibers would quickly disperse and turbidity readings would return to normal. The expended material could also be transported long distances before becoming incorporated into the bottom sediments.

A review of numerous toxicological studies indicated that the principal components of chaff are unlikely to have significant effects on humans and the environment, based on the general toxicity of the components, the dispersion patterns, and the unlikelihood of the components to interact with other substances in nature to produce synergistic toxic effects (USAF 1997). In addition, available evidence suggests that chaff use does not result in significant accumulation of aluminum in sediments after prolonged training. Sediment samples collected from an area of the Chesapeake Bay where chaff had been used for approximately 25 years indicated that aluminum concentrations in sediments were not significantly different than background concentrations (Wilson et al. 2002).

The small explosive cartridge used to eject the chaff from a small tube may contain hazardous materials (Global Security 2008b). Chaff deployment charges contain approximately 0.49 g (0.02 ounces [oz]) of pyrotechnic materials (USAF 2001). Hazardous materials in pyrotechnic materials are discussed earlier in this section under Flares.

Naval Guns and Small Arms Fire

Naval gunfire exercises use naval gun shells, including 5-in (HE and inert), 76-mm (HE and inert), 57-mm, 25-mm, and 20-mm shells, and small arms rounds. Hazardous materials from shells and small-arms rounds are unexploded shells and metals contained in shell casing, ammunition jackets, and ammunition cores. Shells are composed of steel, brass, copper, tungsten, and other metals, all of which are relatively inert. Live 5-in shells are typically fused to detonate within 3 ft (0.91 m) of the water surface. Shell fragments, unexploded shells, and non-explosive ordnance rapidly decelerate in the water and settle to the ocean floor. Small arms fire includes 0.50-cal machine gun rounds and 7.62-mm projectiles, both of which may contain a lead core. Less than one percent of these materials consist of toxic metals such as lead (DoN 2009).

The presence of shell casings in the sediments would not be expected to substantially affect water quality because brass would undergo slow corrosion, even in a salty environment, and leached substances would be quickly diluted by ocean currents. Most of the ammunition expended during activities involving small arms fire is comprised of steel, with small amounts of aluminum and copper. Steel practice bullets may release small amounts of iron, aluminum, and copper into the sediments and the overlying water column as the bullets corrode. All three elements are widespread in the natural environment, although elevated levels can cause toxic reactions in exposed plants and animals. Any elevation of metals in sediments would be restricted to a small zone around the bullet, and any release to the overlying water column would be quickly diluted.

Close-in weapons systems (CIWS) use 20-mm cannon shells composed of either depleted uranium (DU) or tungsten. DU is "depleted" in that it has only one-third of the isotopes of U^{235} and 60 percent of the radiation as natural uranium (World Health Organization 2009). Depleted uranium is not part of the Proposed Action for this EIS. The Nuclear Regulatory Commission approved the Navy's license application, which clearly stated that CIWS DU rounds would be fired at sea and not recovered. The Navy phased out use of DU rounds in favor of tungsten rounds because of the superior flight characteristics of tungsten and its performance against missile casings. The Navy's transition to tungsten began in 1989, and most rounds with DU have been replaced. None of the surface combatant ships stationed in the Pacific Northwest have DU onboard, and, in February 2009, Commander Pacific Fleet directed that all Pacific Fleet ships offload all DU rounds at the earliest opportunity.

Tungsten has replaced DU in CIWS 20-mm rounds. Tungsten used for munitions is typically a tungsten alloy, where pure tungsten powder is combined with binding materials, such as nickel, iron, copper, or cobalt, that makes the tungsten grains ductile and easy to machine. Tungsten is a naturally occurring element, but not as a pure metal. Tungsten is typically released into the environment via weathering or mining of wolframite and scheelite (Agency for Toxic Substances and Disease Registry [ATSDR] 2005).

In water, tungsten metal and metal alloys will exist as insoluble solids, while tungsten compounds will exist either as ions or insoluble solids (ATSDR 2005). Tungsten compounds typically adsorb to suspended soils and sediment in the water column. Tungsten ions in ocean water have an estimate residence time of approximately 1,000 years, before it is removed from the aquatic phase by sedimentation or other processes (ATSDR 2005). Metallic tungsten dissolves in water, reaching concentrations up to 475-500 mg/L. The dissolution of tungsten is associated with a decrease in dissolved oxygen and pH in both aqueous and soil matrices (Strigul et al. 2005). The corrosion rates of tungsten

alloys increase as pH increases, and also increase with exposure to chloride ions, which are abundant in salt water, in aqueous solution (U.S. Army 1987).

Tungsten is a heavy metal that can have negative effects on humans and other biological organisms. Tungsten alloys may have additional health effects associated with the alloyed metals. The two primary exposures are though inhalation and ingestion. Bullets impacting a hard target may release tungsten particles into the air, but such releases would be small. Some respiratory issues from tungsten have been reported, but reports were in environments where people were exposed to several heavy metals over prolonged periods (ATSDR 2005). Inhalation of tungsten particles by humans or other biological organisms would not be likely because of the distance offshore that training takes place. Reports of oral consumption of tungsten and tungsten alloys by humans or other biological organisms are limited. Rats implanted with pellets of weapons-grade tungsten alloy developed aggressive tumors surrounding the pellets (Kalinich et al. 2005). A study on the use of tungsten in shot for waterfowl hunting, adult mallards (*Anas platyrhynchos*) were fed several types of shot, including tungsten-iron and tungsten-polymer shot. None of the ducks that were fed either tungsten shot died during the 150-day trial (Mitchell et al. 2001). Significant liver hemosiderosis was present in some ducks for all types of shot, but it was determined that neither type of tungsten shot had deleterious health effects based on mortality, body weights, organ weights and histology of the liver and kidneys (Mitchell et al. 2001).

Sonobuoys

Sonobuoys are used for ASW training exercises under both Alternatives 1 and 2. Sonobuoys are expendable metal cylinders launched from aircraft and ships that collect and generate information about the marine environment and potential threats and targets. Sonobuoys consist of two main sections, a surface unit that contains the seawater battery and a metal subsurface unit (see Appendix H for physical descriptions of sonobuoys). The seawater battery is activated upon contact with the water. The subsurface assembly descends to a selected depth, the sonobuoy case falls away, and sea anchors deploy to stabilize the hydrophone (underwater microphone) (Global Security 2008e).

Sonobuoys are designed to be expended upon completion of training exercises. Scuttled sonobuoys sink to the ocean floor, where they are subjected to the corrosion and sedimentation caused by ocean currents. Occasionally, an expended sonobuoy may become flotsam if it fails to be scuttled (sink to the ocean floor). Sonobuoys as flotsam move with ocean currents until they either sink or are washed ashore. Scuttled sonobuoys contain a small amount of hazardous materials, but do not pose a threat to public safety, water quality, or biological resources. Hazardous materials leach slowly, and are not expected to substantially affect the environment.

Sonobuoys contain other metal and nonmetal components, such as metal housing (nickel-plated, steel-coated with polyvinyl chloride [PVC] plastics to reduce corrosion), batteries, lead solder, copper wire, and lead ballast that, over time, can release hazardous constituents into the surrounding water. Most of the other sonobuoy components are either coated with plastic to reduce corrosion or are solid metal. The slow rate at which solid metal components corrode in seawater translates into slow release rates into the marine environment. Once the metal surfaces corrode, the rates at which metals are released into the environment decrease. Releases of chemical constituents from metal and nonmetal sonobuoy components are further reduced by encrustation of exposed surfaces by benthic organisms. Therefore, toxic components of the sonobuoy do not substantially degrade marine water quality. Hazardous constituent contents of sonobuoys are provided in Table 3.2-7, based on the composition of similar sonobuoys used by the Navy for training off San Clemente Island.

Table 3.2-7: Sonobuoy Hazardous Constituents

Constituent	Weight (lb) per Sonobuoy
Copper thiocyanate	1.59
Fluorocarbons	0.02
Copper	0.34
Lead	0.94
Tin/lead plated steel	0.06
Total	2.95

Source: U.S. Department of the Navy, San Clemente Island Ordnance Database [No Date]

Approximately 0.04 lb (20 g) of lead solder are used in the internal wiring (solder) of each sonobuoy, and 0.85 lb (425 g) of lead are used for the hydrophone and lead shot ballast. Lead in sonobuoys is in an un-ionized metallic form that is insoluble in water, so the lead shot and solder are not released into the seawater. Various lead salts, which have low solubilities, likely form on the exposed metal surfaces. For these reasons, lead components of the sonobuoy do not substantially degrade marine water quality.

Sonobuoys contain small amounts of FC-77 Fluorinert® Electronic Liquid in the sonobuoy compass. The perfluorinated portion of the electronic liquid is resistant to degradation in most environments. Fluorinert® Electronic Liquid has a low solubility and an insignificant toxicity to aquatic organisms, with the Lethal Level (where the material causes the death of 50 percent of a group of aquatic organisms) greater than 1,000 milligrams per liter (mg/L; 3M Company 2009).

Batteries

Sonobuoys may contain up to three different types of batteries (seawater, lithium, and thermal), depending on the type of sonobuoy. Regardless of type, each sonobuoy contains a seawater battery housed in the upper, floating portion that supplies power to the sonobuoy. These seawater batteries contain 0.7 lb to 0.9 lb (300 to 400 g) of lead (DoN 2008a). In cases where the upper portion of the sonobuoy is lost to the seabed, the lead batteries are also lost. Chemical reactions within sonobuoy batteries proceed almost to completion once the cell is activated, and only a small amount of reactants remain when the battery life ends. These residual materials slowly dissolve, and are diluted by ongoing ocean and tidal currents. In addition, the exterior metal casing can become encrusted by marine organisms or coated by corrosion, thus slowing the rate of further corrosion. Also, many of the components of concern are coated with plastic to reduce corrosion, providing an effective barrier to water exchange. In instances where seawater corrodes the sonobuoy, that corrosion takes at least 40 years (Klassen 2005).

The approach used to evaluate the environmental effects of seawater batteries involved comparing the expected concentrations of potentially toxic battery constituents with U.S. Environmental Protection Agency (USEPA) water quality criteria that have been established for the protection of aquatic life (USEPA 2006) or the best available literature values that established conservative toxicity thresholds (Table 3.2-8). This assessment applies the findings from a study reported by Naval Facilities Engineering Command (NAVFAC) (DoN 1993, Appendix D) in a sonobuoy training document developed for activities at San Clemente Island, California. The study involved a laboratory experiment where activated seawater batteries were held in a 64-liter (17-gallon) seawater bath for eight hours to provide an empirical estimate of expected leach rates for metals of concern. Water column concentrations of metals at the end of the exposure can be used to derive average leaching rates, and can then be interpreted in the context of minimum current velocities to estimate maximum field exposures. The exposure scenario applied in the NAVFAC report represents reasonable and conservative assumptions that have been retained for this

analysis. It is assumed that only one seawater battery will occupy the test volume within its eight-hour operating life span. No vertical turbulence is applied, and the horizontal ocean current flow is set at two inches per second (in/sec) (five centimeters per second [cm/sec]).

Table 3.2-8: Threshold Values for Safe Exposure to Selected Metals

Metal	Criteria (µg/L)	
	Acute (1-hour exposure)	Chronic (4-day mean exposure)
Lead	210	8.1
Silver	1.9	NA
Copper	4.8	3.1
Lithium[1]	6,000	NA

Notes: NA = no chronic value is available; µg/L = microgram per liter. (1) No EPA criteria available; values shown are based on published literature (Kszos et al., 2003)
Source: USEPA 2006

The sonobuoy battery experiment employed lead chloride batteries over an eight-hour period. The concentration of lead at the end of the exposure in the bath was 0.2 mg/L (DoN 1993). Hence, the total amount of lead leached from the battery was (0.2 mg × 64 L =) 12.8 mg. As shown in Table 3.2-9, the rate is thus 1.6 milligrams per hour (mg/hr), or 0.000444 milligrams per second (mg/sec). Applying a highly conservative model, wherein all of the lead released in a single second is contained within 1 mL, the concentration would be 0.4 mg/L.

Table 3.2-9: Calculations to Characterize Maximum Lead Exposure Concentrations

Description of Calculation	Operation	Result
Total amount of lead leached from battery	0.2 mg/L x 64 L =	12.8 mg/8 hr
Per-hour rate	12.8 mg/8 hrs =	1.6 mg/hr
Per-second rate	1.6/hr/(60 min/hr × 60 sec/min) =	0.000444 mg/sec
Concentration into 1 mL	0.000444 mg/mL × 1,000 mL/L =	0.4 mg/L
Two-second dilution	0.4/2 =	0.2 mg/L or 200 µg/L

Source: DoN 2008b

Considering each milliliter as a discrete parcel, a reasonable dilution model at a current velocity of five cm/sec (two in/sec) assumes that the contaminated section is diluted by a factor of two per second. Thus, the lead released from the battery is diluted to 0.2 mg/L or 200 µg/L, in two seconds, which is less than the acute criteria of 210 µg/L, a criteria applied as a one-hour mean. Likewise, assuming the exponential factor of two dilutions, the concentration is less than the chronic limit (8.1 µg/L) in seven seconds. Therefore, lead chloride batteries will not substantially degrade marine water quality. Table 3.2-9 provides a description and summary of the calculations performed to determine the potential effects of scuttled lead chloride batteries.

The relatively large differences in the propensity of lead ions (Pb^{+2}) to solubilize relative to copper (Cu^{+2}) and silver (Ag^{+}) ions assures that the potential effects of batteries containing silver chloride or copper thiocyanate are substantially lower than those of a lead chloride battery. Sonobuoy batteries represent the greatest release of copper because copper thiocyanate is soluble. The peak concentration of copper released from a cuprous thiocyanate seawater battery was calculated to be 0.015 µg/L (DoN 1993), which is substantially lower than USEPA acute and chronic toxicity criteria. While the copper thiocyanate battery also would release cyanide, a material often toxic to marine organisms, thiocyanate is tightly bound, and will form a salt or bind to bottom sediments. Therefore, the risk from thiocyanate is very low.

The AN/SSQ-62D and AN/SSQ-62E DICASS have been improved with the replacement of the standard lithium battery with a lithium iron disulfide thermal battery. An important component of the thermal battery is a hermetically sealed casing, which is Series 300 welded stainless steel 0.7- to 2.54-mm (0.03- to 0.1-in) thick and resistant to the battery electrolytes (DoN 2008b). The electrochemical system in the thermal battery includes an iron disulfide cathode and a lithium alloy anode. In addition, the electrolyte mixture includes chloride, bromide, and iodide salts of lithium and potassium. This mixture is inert and nonconductive until the battery is activated. Upon activation, the mixture becomes molten and highly conductive, allowing the cathode to interact efficiently with the anode. The thermal source is a mixture of iron powder and potassium perchlorate. In the case of extreme degradation of the battery housing on the ocean floor, risks from thermal batteries would be similar to those from lithium batteries (i.e., negligible) but less so because the iron alloy is less soluble.

Lithium batteries are used in DICASS sonobuoys but not in the explosive sonobuoy (AN/SSQ-110A). These batteries are contained within a metal casing housing sulfur dioxide, lithium metal, carbon, acetonitrile, and lithium bromide. The environmental fate of lithium batteries during and after training exercises has already been described in this section under Underwater Targets.

Detonation Byproducts

One type of explosive sonobuoy is proposed for use, the SSQ-110A. This sonobuoy is composed of two sections, an active (explosive) section and a passive section. The upper section is similar to the upper electronics package of the SSQ-62 DICASS sonobuoy, while the lower section consists of two payloads of explosive, weighing 4.2 lb (1.9 kg) each (Global Security 2008c). This explosive is composed of cyclo-1,3,5-tetramethylene-2,4,6-tetranitramine (HLX), which is 90-percent RDX, plus small amounts (less than 0.3 g) of PBX and hexanitrostilbene, a detonator component. Once in the water, the charges explode, creating a loud acoustic signal.

The explosion creates an air bubble of gaseous byproducts that travels to the surface and escapes into the atmosphere. Some of the gas, however, dissolves into the water column. The byproducts with the greatest toxicity are hydrogen fluoride compounds (H_xF_x), reaction byproducts associated with the binding agent used to stabilize the HLX. Natural exposure levels and effects in saltwater would need to be characterized to provide a basis for assessing effects on marine systems. Only a small percentage (0.63 percent) of the available H_xF_x explosion byproduct, however, dissolves in the water prior to the bubble reaching the surface, and the H_xF_x is rapidly diluted upon mixing with the adjacent water column (National Oceanic and Atmospheric Administration 2008).

Torpedoes

MK-48 ADCAP torpedoes would only be used in the TMAA under Alternative 2 (Preferred Alternative). Torpedoes typically contain hazardous materials such as propellants, petroleum products and lubricants, components of guidance systems and instrumentation, and explosives in warheads. The ADCAP torpedo is an acoustic homing torpedo used in force protection. It is 19 ft (5.8 m) long, with a 21-inch diameter, and weighs about 3,700 lb (1,680 kg). Although the hazardous materials list for the MK-48 is classified, the MK-48 torpedo contains approximately 851 lb (383 kg) of explosives and uses Otto Fuel II as a propellant. Most of the explosive is consumed upon detonation of the torpedo.

OTTO Fuel II propulsion systems are used in MK-48 torpedoes. Otto Fuel II is a liquid propellant composed of propylene glycol dinitrate and nitro-diphenylamine (76 percent), dibutyl sebacate (23 percent) and 2-nitrodiphenylamine as a stabilizer (2 percent), and may be toxic to marine organisms (DoN 1996b,c). There have been approximately 30,000 exercise test runs of the MK-48 torpedo over the last 25 years (DoN 1996c). Most of these launches have been on Navy test ranges, where there have been no reports of deleterious effects on marine water quality from OTTO Fuel II or its combustion products

(DoN 1996b,c). Furthermore, Navy studies conducted at torpedo test ranges that have lower flushing rates than the open ocean did not detect residual OTTO Fuel II in the marine environment (DoN 1996b,c). Thus, no adverse effects are anticipated from use of this fuel.

Exhaust products from the combustion of OTTO Fuel II include NO_x, CO, carbon dioxide (CO_2), hydrogen (H_2), nitrogen (N_2), methane (CH_4), ammonia (NH_3), and hydrogen cyanide (HCN) (DoN 1996b,c). These combustion products are released to the ocean, where they are dissolved, disassociated, or dispersed in the water column. These combustion products are not expected to substantially affect the marine environment. Except for HCN, combustion products are not a concern (DoN 1996b,c) because:

- Most OTTO Fuel II combustion products, specifically water, CO_2, N_2, CH_4, and NH_3, occur naturally in seawater.
- Several of the combustion products are bioactive. N_2 is converted into nitrogen compounds through nitrogen fixation by certain cyanobacteria, providing nitrogen sources and essential micronutrients for marine phytoplankton. CO_2 and CH_4 are integral parts of the carbon cycle in the oceans, and are taken up by many marine organisms.
- CO and H_2 have low solubility in seawater and excess gases bubble to the surface.
- Trace amounts of NO_x may be present, but they are usually below detectable limits. NO_x in low concentrations are not harmful to marine organisms, and are a micronutrient source of nitrogen for aquatic plant life.
- Ammonia can be toxic to marine organisms in high concentrations, but releases from OTTO fuel are quickly diluted to negligible levels.

HCN does not normally occur in seawater and, at high concentrations, could pose a risk to both humans and marine biota. The USEPA acute and chronic national recommendation for cyanide in marine waters is 1.0 µg/L, or 1 part per billion (ppb) (DoN 1996b,c). HCN concentrations ranging from 140 to 150 ppb will be discharged from MK-48 torpedoes (DoN 1996c). These initial concentrations are well above the level recommended by USEPA for cyanide. However, because it is very soluble in seawater, HCN will be diluted to less than 1 µg/L at 17.7 ft (5.4 m) from the center of the torpedo's path when first discharged, and thus should pose no substantial threat to marine organisms.

Each torpedo also deploys a guidance wire with a flex hose during each run. The guidance wire is composed of copper and cadmium within a plastic coating, and is about 0.04 inch in diameter (0.1 cm) (DoN 2008b). The MK-48 torpedo uses either a Strong Flexible Hose (SFH) or Improved Flexible Hose (IFH). The flex hose is typically 250-ft long and less than a half inch in diameter, and will sink rapidly to the ocean floor once expended. The IFH is a multi-component design that consists of a stainless-steel spring overlaid with a polyester braid and then a layer of lead tape (DoN 1996b). The entire assembly is then overlaid with a stainless-steel wire braid. The IFH contains 24 kg (53 lb) of metallic lead. The SFH is constructed primarily of stainless steel, and contains no lead or other materials that may pose a threat to the marine environment (DoN 1996b).

The potential for the release of lead into the ocean bottom environment immediately surrounding the IFH to have adverse effects on pelagic and benthic organisms was analyzed. Benthic marine organisms that are near the IFH may be exposed to low concentrations of lead slowly released over time from the IFH. In marine biota, lead residues are generally highest near sources (e.g., disposal sites, dredging sites, mining areas), but no significant biomagnification of lead occurs in aquatic food chains (Eisler 1988).

3.2.1.2 Current Requirements and Practices

Releases or discharges of hazardous wastes or materials are heavily regulated through comprehensive federal and state processes. In addition, the International Convention for the Prevention of Pollution from Ships (MARPOL) prohibits certain discharges of oil, garbage, and other substances from vessels. The MARPOL convention is implemented by national legislation, including the Act to Prevent Pollution from Ships (33 U.S. Code [U.S.C.] 1901, et seq.) and the federal Water Pollution Control Act (Clean Water Act [CWA]"; 33 U.S.C. 1321, et seq.). These and other requirements are implemented by Navy guidance documents and manuals (e.g., Chief of Naval Operations Instruction [OPNAVINST] 5090.1C, *Navy Environmental and Natural Resources Program Manual*) [DoN 2007]) that require hazardous materials to be stored and handled appropriately, both ashore and afloat.

At sea, Navy vessels are required to operate in a manner that minimizes or eliminates any adverse impacts to the marine environment. Environmental compliance policies and procedures applicable to shipboard activities afloat are defined in: the *Navy Environmental and Natural Resources Program Manual* (OPNAVINST 5090.1C), Chapter 4, "Pollution Prevention," and Chapter 22, "Environmental Compliance Afloat"; and Department of Defense (DoD) Instruction 5000.2-R (§C5.2.3.5.10.8, "Pollution Prevention") (DoN 2007). In addition, provisions in Executive Order (EO) 12856, *Federal Compliance With Right-To-Know Laws and Pollution Prevention Requirements*, and EO 13101, *Greening the Government through Waste Prevention, Recycling, and Federal Acquisition*, reinforce the CWA prohibition against discharge of harmful quantities of hazardous substances into U.S. waters out to 200 nm (371 km), and mandate stringent hazardous waste discharge and storage, dumping, and pollution prevention requirements.

3.2.2 Environmental Consequences

As noted in Section 3.2.1, the ROI for expended materials includes the TMAA. Navy training activities that occur within the Air Force inland Special Use Airspace and the Army inland training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) are analyzed in this EIS/OEIS pursuant to EO 12114.

3.2.2.1 Previous Analyses

Impacts related to expended materials and their hazardous constituents were previously evaluated in Section 1.6.2.2 of the *Alaska Military Operations Areas EIS* (USAF 1995); Section 3.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007); Sections 3.8, 3.9, 4.8, and 4.9 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999); and Sections 3.17, 4.4, 4.5, 4.6, 4.7, and 4.17 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.2.2.2 Regulatory Framework

Expended materials and hazardous materials are regulated by international, federal, and state laws and regulations. Navy training in the TMAA occurs beyond 12 nm from shore, which is beyond the State seaward and the territorial seas boundaries. Only regulations on the high seas, in the U.S. Exclusive Economic Zone, and in the contiguous zone are applicable. Most Federal and all State regulations are not applicable to expended materials during Navy training exercises in the TMAA, and are provided only for informational purposes.

International Regulation - MARPOL 73/78

MARPOL 73/78, the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978, is the primary international marine environmental convention. It is intended to minimize pollution of the seas, including oil, sewage, garbage, and harmful substances. MARPOL limits the dumping from ships based upon the type of materials expended, with plastics as the primary concern. Discharge restrictions are also based on distances of ships from coastal waters.

Federal Laws and Regulations

Federal laws and regulations applicable to Navy training in the TMAA are the Marine Protection, Research, and Sanctuaries Act, and the Oil Pollution Act. The RCRA, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Toxic Substances Control Act (TSCA), the Hazardous Materials Transport Act, and the Emergency Planning and Community Right to Know Act are not applicable because training takes place outside of the U.S. territorial seas; these regulations are provided only for informational purposes.

Marine Protection, Research, and Sanctuaries Act

The Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), also known as the Ocean Dumping Act, was enacted to regulate materials dumped into ocean waters that could endanger human health, welfare, and amenities, and the marine environment, ecological systems, and economic possibilities. The Ocean Dumping Act regulates the disposal of any material in the U.S. territorial seas or contiguous zones, as well as the marine disposal anywhere of waste and other material that originated in U.S. territory or was transported on American vessels or aircraft.

The Navy currently holds a General Permit for Sinking Exercise (SINKEX) activities from the USEPA under the MPRSA (40 CFR §229.2, Transport of Target Vessels). This MPRSA permit allows the Navy to transport vessels in ocean waters with the purpose of sinking the vessel. Pursuant to the MPRSA permit, vessel sinkings must be conducted in water at least 6,000 ft (1,830 m) deep and at least 50 nm (93 km) from land. Regulations require that measures be taken to ensure that the vessel sinks to the bottom rapidly and permanently, and does not pose a hazard to marine navigation. In addition, the MPRSA permit requires the "appropriate measures be taken to remove, to the maximum extent practicable, all materials that may degrade the marine environment." This includes, but is not limited to, emptying all fuel tanks and fuel lines to the lowest point practicable and removal of trash, floatable materials, and mercury or fluorocarbon containing materials capable of contributing to chemical pollution.

The August 1999 SINKEX Letter of Agreement between USEPA and the Navy identifies polychlorinated biphenyls (PCBs) as a potential contaminant of concern that may be found in certain solid materials, such as insulation, wires, felts, and rubber gaskets, on SINKEX vessels. In the past, vessels used for SINKEX had most of the solid PCBs removed, leaving estimates of up to 100 lb of PCBs on board with sinking took place (USEPA 1999). The August 1999 Letter of Agreement created the following measures to the MPRSA permit for removal of materials that may degrade the marine environment:

1. Before engaging in a SINKEX, the Navy must conduct an inventory of each SINKEX vessel to ascertain the presence of PCBs. This inventory and list of items removed prior to sinking must be provided to USEPA in the annual report (see item 4 below). Before sinking a SINKEX vessel, qualified personnel at a Navy or other approved facility shall:
    a. Remove all transformers containing three lb or more of dielectric fluid and all capacitors containing three lb or more of dielectric fluid.
    b. Use all reasonable efforts to remove any capacitors and transformers containing less than three lb of dielectric fluid from the vessel. Reasonable efforts include, but are not

necessarily limited to, the removal of capacitors from electrical and control panels by using hand tools such as wire or bolt cutters or a screwdriver.

c. Drain and flush hydraulic equipment, heat transfer equipment, high/low pressure systems, cutting power machinery which uses cooling or cutting oil, and containers containing liquid PCBs at ≤ 50 parts per million.

2. USEPA believes it is often practicable to remove non-liquid PCBs, including air handling system gaskets, rubber; plastic, dried applied paint that is flaked-off, electrical cable insulation, and other non-liquid coatings and material, before sinking the vessel. To the extent that their removal is practicable, these non-liquid PCBs are required to be removed under the MPRSA permit. However, when such objects cannot be practicably removed or their removal threatens the structural integrity of the vessels so as to impede the SINKEX, the Navy may leave such items in place (e.g., felt materials that are bonded in bolted flanges or mounted under heavy equipment, certain paints and adhesives).

3. Navy shall dispose of all removed PCBs or items containing PCBs in accordance with the TSCA PCB regulations.

4. Navy shall report annually to USEPA the efforts taken to clean each vessel prior to SINKEX and an estimate of the weight of PCBs present on board at the time of sinking; the locations of all SINKEX vessels sunk that year, presented as the vessels' location on the bottom within 500 yards; and the water depth at which the vessel rests. This information shall be included in the annual report to USEPA that is required by the MPRSA permit.

Oil Pollution Act

The Oil Pollution Act requires oil storage facilities and vessels to submit plans to the federal government describing how they will respond to the unplanned release of oil and other hazardous materials (33 U.S.C. 2701, et seq.). The OPA provides regulations for the prevention of the discharge of oil into the ocean waters out to the limits of the contiguous zone. Oil and hazardous releases are also reported and remediated according to current Navy policies.

Resource Conservation and Recovery Act

RCRA applies only to solid wastes, as those materials are defined in 40 Code of Federal Regulations (CFR) §261.2. RCRA defines a hazardous waste as a solid waste that can cause, or substantially contribute to, an increase in mortality or serious illness due to its quantity, concentration, or physical, chemical, or infectious characteristics, or which can pose a hazard to human health or the environment when improperly transported, managed, treated, stored, or disposed of (42 U.S.C. 6901, et seq.).

The Military Munitions Rule (MMR) identifies when military munitions become solid wastes under RCRA. Under the MMR, military munitions include: confined gaseous, liquid, and solid propellants; explosives; pyrotechnics; and chemical and riot agents. The MMR provides that the use of these munitions to train military personnel on a designated military range constitute the normal use of the product, so they are not solid wastes and are not subject to RCRA regulation. As defined by the MMR, a used or fired military munition is considered to be a solid waste only if "… the munition lands off-range and is not promptly rendered safe or retrieved" (40 CFR §266.202). Under the MMR, wholly inert items and non-ordnance training materials are not defined as military munitions.

Hazardous materials are considered solid wastes if they are used in a manner constituting disposal rather than for their intended purpose. Expended materials are considered solid waste under the RCRA when

discarded materials are "abandoned." A material is abandoned if it is disposed of; burned or incinerated; or accumulated, stored, or treated before or instead of being disposed of.

Comprehensive Environmental Response, Compensation, and Liability Act

CERCLA – the Superfund program – defines hazardous material as any substance that, due to its quantity, concentration, or physical and chemical characteristics, poses a potential hazard to human health and safety or to the environment. CERCLA has established national policies and procedures to identify and clean-up sites contaminated by hazardous substances, including military installations. No CERCLA sites are located in the TMAA.

Toxic Substances Control Act

The TSCA requires reporting, record-keeping, and testing requirements, and restrictions related to chemical substances or mixtures. TSCA also address the use and disposal of specific chemicals, such as polychlorinated biphenyls (PCBs). PCB production was banned in 1973, but PCBs may be present in products manufactured before the ban. PCBs may be found in PVC coatings of electrical wiring, transformers, and hydraulic fluids.

Hazardous Materials Transportation Law

For air, sea, or land transportation, the U.S. Department of Transportation defines a hazardous material as a substance or material that is capable of posing an unreasonable risk to health, safety, and property when transported in commerce (49 U.S.C. 5101, et seq.; 49 C.F.R. 172.101, Appendix B). This law regulates the preparation, identification, and transportation process for hazardous materials.

Emergency Planning and Community Right-to-Know Act

The Emergency Planning and Community Right to Know Act requires federal, state, and local governments and industry to report on their use of hazardous and toxic chemicals (42 U.S.C. 116, et seq.).

State Laws and Regulations

Alaska regulations on expended and hazardous materials are not applicable to Navy training in the TMAA because no training activities take place within State waters (up to three nm from shore). The following discussion of regulations is for informational purposes only.

Solid wastes and hazardous materials are regulated by the Alaska Department of Environmental Conservation (ADEC). Alaska has adopted the federal MMR by reference, but has not developed any state-specific military munitions regulations. The provisions of the MMR are regulated by the Waste Management Division of the ADEC. Solid waste regulations are established by Alaska Administrative Code Title 18, Chapter 60: Solid Waste. The Waste Management division enforces the State of Alaska's hazardous waste regulations, which can be found in Alaska Statutes Title 46, Chapter 3 (e.g., Section 296 [Hazardous Waste Disposal], Section 299 [Hazardous Waste Regulations]; and Section 308 [Transportation of Hazardous Waste], and in Chapter 9 [Hazardous Substance Release Control]). The Navy complies with applicable state regulations under EO 12088, *Federal Compliance with Pollution Control Standards*; DoD Directive 4165.60, *Solid Waste Management*; and Navy guidelines for hazardous materials and wastes management.

Alaska oil pollution control regulations are found in the Alaska Statutes Title 46, Chapter 5 and Chapter 8. These regulations address issues with transportation and liability of petroleum products. Alaska has developed contingency plans for the State that describe the strategy for a coordinated federal, state, and local response to a discharge or substantial threat of discharge of oil or a release of a hazardous substance from a vessel, offshore facility, or onshore facility.

3.2.2.3 Approach to Analysis

Data Sources

Relevant literature was systematically reviewed to complete this analysis of expended materials in the GOA. The review included journals, DoD reports and operational manuals, natural resource management plans and other technical reports published by government agencies, prior environmental documents for facilities and activities in the GOA, and work conducted by private businesses and consulting firms.

Assessment Methods

For each alternative, this document characterizes and quantifies the total amount of training materials, both hazardous and nonhazardous, that are expended annually during Navy training in the TMAA. Hazardous material weights are calculated based on assumptions identified in Section 3.2.1.1 for each expended training material. This analysis does not include materials expended during Navy training in the inland lands of the GOA because those activities are covered by Army and Air Force documents identified in Section 3.2.2.1.

This analysis assumes that expended training materials are deposited on 20 percent of the available training area (TMAA) (DoN 2009). The TMAA consists of an ocean area of approximately 42,146 nm^2 (145,482 square kilometers [km^2]). Deposition of expended materials across 20 percent of the training area would affect an area of approximately 8,430 nm^2 (29,100 km^2). This is a conservative assumption that is based on Navy personnel experience, which indicates that the distribution of training exercises within ocean training areas is not uniform.

Aircraft overflights occur under all of the alternatives. Aircraft overflights between the TMAA and the Alaska inland training areas would not involve expenditures of training materials. Therefore, aircraft overflights in the GOA will not be addressed further in this section.

3.2.2.4 No Action Alternative

The No Action Alternative is the baseline condition for Navy training in the TMAA. This section analyzes current levels of Navy training for annual expenditure of training materials and their hazardous constituents. Table 3.2-1 summarizes the training items that may present issues related to expended materials. The amounts and types of training materials expended under the No Action Alternative are described below. Table 3.2-10 provides the annual numbers and weights of expended materials under the No Action Alternative.

Table 3.2-10: Summary of Expended and Hazardous Training Materials – No Action Alternative

Type of Training Material	Number of Items	Material Weight (lb)		Hazardous Content (%)
		Total Expended	Hazardous	
Bombs	120	54,000	395	0.73
Missiles	22	6,770	56.4	0.83
Targets & pyrotechnics	252	3,610	27.2	0.75
Naval gun shells	10,564	10,700	1,320	12.3
Small arms rounds	5,000	180	1.80	1.00
Sonobuoys	24	936	70.8	7.56
Total	**15,982**	**76,200**	**1,870**	**2.45**

Notes: Numbers of training items are estimates. Weights and percentages are rounded to a maximum of three significant digits.

Bombs

Under the No Action Alternative, 120 bombs will be expended annually during training, of which 72 (about 60 percent) will be inert. Expended bombs will deposit approximately 54,000 lb (24,300 kg) of training materials per year, distributed over the TMAA at an average density of 6.4 lb per nm^2 (0.83 kg per km^2), assuming deposition of expended materials over 20 percent of the TMAA (42,146 nm^2 [145,482 km^2]). The primary hazardous material from bombs is residual explosives. Most of the residual explosives will result from bombs that are duds. Approximately 395 lb (180 kg) of explosives will be left unconsumed, which will deposit about 0.05 lb per nm^2 (less than 0.01 kg per km^2) of hazardous material in the TMAA. Practice bombs contain a small amount of explosives for use as a spotting charge. Upon impact, spotting charges will combust and be consumed, producing smoke in the process. Explosives are generally insoluble in water, and will leach slowly into the marine environment. Explosive material will break down on the ocean floor, and will not accumulate over time. Ocean currents will disperse leaching materials quickly. Bomb casings may contain anti-corrosion coatings and metals, but these substances typically constitute less than one percent of the casing's weight. Bomb casings will degrade slowly, and leaching will be further slowed by encrusting and sedimentation. The environmental fate of expended bombs is described in greater detail in Section 3.2.1.1. Due to the low areal density of expended materials and the low amount of hazardous material, expended bombs will have a minimal impact on the benthic environment.

Missiles

Twenty-two missiles will be used annually under the No Action Alternative. Approximately 50 percent of missiles used during aviation exercises are inert versions, and do not explode on contact with the target or ocean surface. Exploding warheads may be used in air-to-air missile exercises but, to avoid damaging the aerial target, the missile explodes in the air, disintegrates, and falls into the ocean. Live missiles used in air-to surface exercises explode near the water surface. Approximately 6,770 lb (3,050 kg) of expended materials from missiles will be deposited annually on the ocean floor, resulting in an average density of 0.8 lb per nm^2 (0.1 kg per km^2) per year. Hazardous materials from expended missiles consist of residual missile propellants and unconsumed explosives from missiles that are duds. Under the No Action Alternative, expended missiles will annually result in approximately 56.4 lb (25.6 kg) (approximately 38 lb [17 kg] of explosives and 18 lb [8.1 kg] of propellant) in the TMAA. These amounts of hazardous materials are not expected to have a substantial effect because of the large deposition area and subsequent dispersal by ocean currents. The deposition of the missile body in the water will have minimal effects on water quality because it will become encrusted through chemical processes and the growth of benthic organisms, slowing leaching.

The principal source of potential impacts on water and sediment quality will be unburned solid propellant residue and batteries. Solid propellant fragments will sink to the ocean floor and will undergo changes in the presence of seawater. The propellant concentration will decrease over time as the leaching rate decreases and further dilution occurs. The aluminum will remain in the propellant binder, and eventually will be oxidized by seawater to aluminum oxide. The remaining binder material and aluminum oxide will pose no threat to the marine environment.

Targets and Pyrotechnics

Table 3.2-11 summarizes the types and numbers of targets and pyrotechnics that will be used annually under the No Action Alternative. Targets used in training exercises will be recovered, unless otherwise noted.

Table 3.2-11: Targets and Pyrotechnics – No Action Alternative

Type of Target or Pyrotechnic	Number of Items
Targets	
TDU-34 towed target	2
TALD*	8
BQM-74E unmanned aircraft	2
Killer Tomato surface target	10
SPAR	10
Pyrotechnics	
LUU-2B/B*	12
MK-58 Marine Marker*	20
Chaff*	212
Total number used	**276**
Total not recovered	**252**
Total expended weight (lb)	**3,610**

*Not recovered

Under the No Action Alternative, LUU-2B/B illuminating flares, TALDs, chaff, and MK-58 marine markers will not be recovered, resulting in approximately 3,610 lb (1,640 kg) of expended training materials per year. Illuminating flares and marine markers are consumed during use. Flares typically contain approximately 0.85 lb of residual pyrotechnic material, which is considered to be hazardous. Flare use under the No Action Alternative will deposit approximately 27.2 lb (12.4 kg) of hazardous materials annually in the TMAA. Smoke from marine markers rapidly diffuses by air movement. The marker itself is not designed to be recovered, and will eventually sink to the bottom and become encrusted or incorporated into the sediments. Phosphorus contained in the marker will settle to the ocean floor, where it will react with the water to produce phosphoric acid until all phosphorus is consumed. Combustion of red phosphorus produces phosphorus oxides, which have a low toxicity to aquatic organisms. Red phosphorus released during training is not anticipated to substantially affect the marine environment (DoN 2006).

TALDs will result in approximately 16 expended thermal batteries per year, which contain chemicals considered to be hazardous. Expended thermal batteries will not have a substantial impact to the environment because chemical reactions in batteries continue until battery life ends, with only a small amount of reactants remaining. Remaining chemicals, most of which are abundant in the ocean, will leach slowly, and will be diluted by ocean and tidal currents. The environmental fates of batteries are described in Section 3.2.1.1.

Chaff will only be used during Electronic Combat exercises. Approximately 540 lb (245 kg) of chaff will be expended under the No Action Alternative. The environmental fate of chaff is described in Section 3.2.1.1. Chaff fibers will be widely dispersed and will not result in harmful concentrations. The only hazardous material associated with chaff is the pyrotechnic deployment charge (approximately 0.02 oz [0.48 g] of pyrotechnic material for each charge) (USAF 2001). This amount of pyrotechnic material will not affect water or sediment quality because most of the material will be consumed during combustion and the remaining amounts will be dispersed over a large area.

Infrequently, a recoverable target may be lost. In those cases, the hazardous materials of concern include propellant, petroleum products, metals, and batteries. Small concentrations of fuel and ionic metals released during battery operation could enter the water and contaminate limited areas; however, they are

not a source of substantial environmental degradation. The potential impact of expended batteries is discussed in Section 3.2.1.1.

Most target fragments will sink quickly in the ocean. Expended material that sinks to the ocean floor will gradually degrade, be overgrown by marine life, or be incorporated into bottom sediments. Floating nonhazardous expended material may be lost from target boats, and will either degrade over time or wash ashore as flotsam. An extensive study conducted at CFMETR near Nanoose, British Columbia concluded that, in general, the direct impact of expended material accumulation on the ocean floor appeared to be minimal, and had no detectable effects on wildlife or sediment quality (CFMETR 2005). Under the No Action Alternative, no measurable impact on the environment will occur within the study area because the majority of targets will be recovered after use and the majority of expended materials are inert, and will be buried in bottom sediments.

Naval Gun Shells

Under the No Action Alternative, 10,564 shells will be fired annually, with only 40 HE shells (10 76-mm shells and 30 5-inch shells). The majority of expended shells will be 20-mm and 25-mm shells. The total weight of expended naval shells will be approximately 10,700 lb (4,860 kg) per year. Navy training in the TMAA will annually deposit approximately 1,320 lb (600 kg) of hazardous material from shells in the TMAA, which will be approximately 0.16 lb per nm^2 (0.02 kg per km^2). Hazardous materials of gun shells are explosive materials (from duds) and heavy metals in projectiles. Most of the hazardous material is from tungsten in CIWS 20-mm shells. Under the No Action Alternative, approximately 1,200 lb (545 kg) of tungsten will be expended. Tungsten alloys will be in insoluble forms, and will settle to the ocean floor and be covered by sediment. Metals will leach slowly, but the amounts of other metals associated with tungsten alloy (copper, cobalt, nickel, iron) will be too small to have a substantial effect on the marine sediment. The degradation of tungsten could increase pH in the surrounding sediment but, with less than one expended 20-mm round per nm^2 (0.27 rounds per km^2) in 20 percent of the TMAA, would not have substantial effects. Hazardous materials are discussed in detail in Section 3.2.1.1.

Live 5-in shells are typically fused to detonate within 3 ft (0.9 m) of the water surface. Shell fragments rapidly decelerate through contact with the surrounding water, and settle to the ocean floor. The impact of naval shells on the environment under the No Action Alternative will be negligible because of the relatively small sizes of the training materials and their broad distribution within the TMAA. The environmental fate of naval gun shells on the ocean bottom will be similar to that of bombs (see discussion above).

Small Arms Rounds

Under the No Action Alternative, 5,000 rounds of small-caliber ammunition (7.62-mm and 0.50-cal) will be expended per year. The combined weight of these expended small arms will be approximately 181 lb (81 kg). Eighty percent of the small-caliber ammunition will be 7.62-mm rounds. Hazardous materials from small arms rounds (heavy metals in projectiles) will weigh less than two lb (less than one kg), which will not have an effect on the marine environment. Hazardous materials are discussed in detail in Section 3.2.1.1. Expended materials from small-caliber ammunition are relatively inert in the marine environment. Expended rounds may release small amounts of lead, antimony, iron, aluminum, and copper into the sediments and the overlying water column as they corrode. The rate of corrosion will be low, however, and releases to the overlying water column will be diluted by ocean and tidal currents.

Sonobuoys

The SSQ-36 BT sonobuoy will be used under the No Action Alternative. The SSQ-36 BT is designed to record the thermal gradient of the water at various depths (Global Security 2008d). The impacts of sonobuoys on the environment are described in Section 3.2.1.1. Under the No Action Alternative, 24

SSQ-36 BT sonobuoys will be expended per year. The estimated weight of expended materials from sonobuoys will be 936 lb (421 kg). Table 3.2-12 provides the weight of hazardous materials for sonobuoys expended under the No Action Alternative. Hazardous materials are discussed in detail in Section 3.2.1.1.

Table 3.2-12: Hazardous Materials from Expended Sonobuoys – No Action Alternative

Constituent	Hazardous Material Weight (lb)	
	Per Sonobuoy	Total
Copper thiocyanate	1.59	38.1
Fluorocarbons	0.02	0.48
Copper	0.34	8.16
Lead	0.94	22.6
Tin/lead plated steel	0.06	1.44
Total	**2.95**	**70.8**

Note: Under the No Action Alternative, 24 sonobuoys would be expended

Approximately 71 lb (32 kg) of hazardous materials from sonobuoys will be deposited in the TMAA under the No Action Alternative. Sonobuoys contain other metal and nonmetal components, such as metal housing (nickel-plated, steel-coated with PVC plastics to reduce corrosion), batteries, lead solder, copper wire, and lead used for ballast that, over time, can release hazardous constituents into the surrounding water. This level of deposition will not affect marine conditions because most of the hazardous materials are in insoluble forms.

Sonobuoys contain the greatest amount of hazardous materials per expended item. Leaching from metals, however, will be slow, and concentrations of hazardous materials will not exceed State or federal water quality standards. Lead has a low solubility in water and leaching is further decreased by encrusting through chemical and natural processes. Lead from expended sonobuoys will degrade slowly, and will not exceed USEPA's maximum acute concentration (210 µg/L) or maximum chronic concentration (8.1 µg/L) for lead (USEPA 2006). Electronics liquids used in the sonobuoy compass would release small amounts of fluorocarbons into the marine environment (Table 3.2-12). The volume of ocean water surrounding expended sonobuoys would quickly dilute fluorocarbons to non-toxic concentrations (less than 1,000 mg/L). Although fluorocarbons are resistant to degradation, they would not be expected to concentrate in any areas of the TMAA.

Sonobuoy batteries represent the greatest release of copper from expended materials because copper thiocyanate is soluble. The peak concentration of copper released from a cuprous thiocyanate seawater battery was calculated to be 0.015 µg/L (DoN 1993), which is substantially lower than USEPA acute and chronic toxicity criteria. While the copper thiocyanate battery also would release cyanide, a material often toxic to marine organisms, the amount of copper thiocyanate in sonobuoys is very low. Thiocyanate is tightly bound, and will form a salt or bind to bottom sediments. The concentration of available thiocyanate released from sonobuoys will be similar to the concentration of copper, which is below the USEPA's maximum acute and chronic toxicity for free cyanide (1 µg/L; USEPA 2006). Therefore, the risk from thiocyanate will be very low. The quality of the water and sediments immediately surrounding an expended sonobuoy may be affected by chemicals leached from the item, but ocean currents will quickly disperse chemicals to nontoxic levels. Thus, expended sonobuoys under the No Action Alternative will not have a substantial effect on the environment.

Summary – No Action Alternative Effects

Under the No Action Alternative, Navy training exercises will annually expend an estimated 15,982 training items or 76,200 lb (34,600 kg) of training materials in the TMAA (see Table 3.2-10). Over 97 percent of the expended items will be naval gun shells or small arms rounds. The density of expended materials distributed over 20 percent of the TMAA will be approximately 1.92 items per nm^2 (0.55 items per km^2) or 9.0 lb per nm^2 (1.2 kg per km^2) per year. Assuming Navy training under the No Action Alternative would remain consistent over periods of 5 and 20 years, the Navy will expend approximately 191 tons (45.2 lb per nm^2 [5.9 kg per km^2]) and 762 tons (181 lb per nm^2 [23.8 kg per km^2]) of training materials in the TMAA, respectively. Most of these materials are relatively inert in the marine environment, and will degrade slowly. Only a small amount of annually expended materials are considered to be hazardous. The density of hazardous materials within the affected areas will be approximately 0.22 lb per nm^2 (0.03 kg per km^2) per year. The majority of these materials will be residual explosive, which break down slowly. Any leaching chemicals will be quickly dispersed by ocean currents, and will not be present in harmful concentrations. Thus, expended materials under the No Action Alternative will not substantially affect marine resources.

3.2.2.5 Alternative 1

This section describes the annual amounts and types of training materials proposed under Alternative 1, compared to annual amounts under the No Action Alternative. Alternative 1 would increase training tempo and introduce ASW training in the TMAA, which would increase in the amount of expended materials. The numbers and weights of training materials that would be expended annually under Alternative 1 are provided in Tables 3.2-13 and 3.2-14.

Table 3.2-13: Numbers and Weights of Expended Training Materials – Alternative 1

Type of Training Material	Quantities of Training Materials by Alternative				Increase under Alternative 1 (%)	
	Alternative 1		No Action Alternative			
	Number	Weight (lb)	Number	Weight (lb)	Number	Weight
Bombs	180	79,900	120	54,000	50	48
Missiles	33	10,200	22	6,770	50	50
Targets and pyrotechnics	322	5,610	252	3,610	28	55
Naval gun shells	13,188	13,800	10,564	10,700	25	28
Small arms rounds	5,700	210	5,000	180	14	17
Sonobuoys	793	30,900	24	936	3,200	3,200
PUTR	7	2,100	NA	NA	NA	NA
Total	**20,223**	**143,000**	**15,982**	**76,200**	**26**	**87**

Note: Numbers of training items are estimates. Weights and percentages are rounded to a maximum of three significant digits.

Table 3.2-14: Expended Materials Considered Hazardous – Alternative 1

Type of Training Material	Weight of Material (lb)[1]		Hazardous Content (%)
	Expended	Hazardous	
Bombs	79,900	617	0.77
Missiles	10,200	84.5	0.83
Targets and pyrotechnics	5,610	190	3.39
Naval gun shells	13,800	1,650	12.0
Small-caliber rounds	210	2.10	1.00
Sonobuoys	30,900	2,340	7.57
PUTR	2,100	0	0
Total	**143,000**	**4,890**	**3.42**

Notes: Weights of expended materials and hazardous contents (%) are estimates, and are rounded to three significant digits. (1) Weights of hazardous materials are based on available information and may not include hazardous weight of all expended materials.

Bombs

Under Alternative 1, an additional 60 bombs would be expended annually, a 50-percent increase over the No Action Alternative. A 48-percent increase (from 54,000 lb [24,300 kg] to 79,900 lb [36,000 kg]) in the weight of training materials expended annually would occur under Alternative 1. The amount of unconsumed explosives would increase from 390 lb (176 kg) per year under the No Action Alternative to 617 lb (278 kg) per year under Alternative 1. This level of deposition would result in approximately 0.07 lb per nm^2 (0.01 kg per km^2) per year of hazardous material in the TMAA. Residual explosive materials would break down slowly, and would not be expected to accumulate. Sixty percent of the bombs used during training exercises would be inert. While inert bombs would contain a small amount of explosives (spotting charge), this amount would be negligible because it would be consumed upon contact with land or water. Given the potential impacts of bombs, as described for the No Action Alternative, and the low amount of hazardous materials, this increase over the No Action Alternative would not have measurable effects in the TMAA.

Missiles

Under Alternative 1, an additional 11 missiles (33 total) would be used over the No Action Alternative, a 50-percent increase over the No Action Alternative. The weight of expended materials would increase by the same percentage (from 6,770 lb [3,050 kg] to 10,200 lb [4,590 kg] per year). Expended hazardous materials would also increase by 50 percent, with 85 lb (38 kg) (57 lb [26 kg] of explosives and 28 lb [13 kg] of propellants being deposited annually in the TMAA. Explosives would leach slowly in the marine environment, and would not be expected to affect water or sediment quality because of the low quantity of material. Missile casings would have a minimal effect on the environment because their relatively inert materials would corrode, and become encrusted by benthic organisms and chemical processes. Hazardous materials would be deposited on the TMAA when missiles suffer ordnance failure or low-order detonations. The small increase in the weight of hazardous materials under Alternative 1 would not have a substantial effect on the environment because of its low density in the TMAA. Contaminants would leach slowly, and would be dispersed rapidly by ocean and tidal currents.

Targets and Pyrotechnics

Table 3.2-15 shows the types and numbers of targets and pyrotechnics that would be expended annually in the TMAA under Alternative 1.

Of the targets and pyrotechnics that would be used under Alternative 1, 322 items would not be recovered annually, which would be a 28-percent increase over the No Action Alternative. Unrecovered targets

would deposit 5,610 lb (2,520 kg) of expended materials per year on the ocean floor, a 55-percent increase over the No Action Alternative. Most of the remaining targets and countermeasures are recovered after use, and these are constructed of relatively inert materials. If targets were lost, they would become buried in bottom sediments or wash up onshore.

Table 3.2-15: Targets and Pyrotechnics – Alternative 1

Types of Targets and Pyrotechnics	Number of Items		Increase Under Alternative 1	
	Alternative 1	No Action Alternative	Number	Percent (%)
Targets				
TDU-34 towed target	3	2	1	50
TALD*	12	8	4	50
BQM-74E unmanned aircraft	2	2	0	0
Killer Tomato surface target	12	10	2	20
SPAR	12	10	2	20
MK-39 EMATT*	20	0	20	NA
Pyrotechnics				
LUU-2B/B*	18	12	6	50
MK-58 Marine Marker*	60	20	40	200
Chaff*	212	212	0	0
Total number used	**351**	**276**	**75**	**27**
Total not recovered	**322**	**252**	**70**	**28**
Total expended weight (tons)	**5,610**	**3,610**	**2,000**	**55**

* Not recovered, NA = Not applicable

Pyrotechnics would mostly be consumed by chemical reactions that produce smoke. Residual pyrotechnic materials from flares would weigh approximately 66 lb (30 kg). This amount of material, spread over 20 percent of the TMAA, would have minimal impacts on the marine environment. Ocean currents would quickly disperse materials, reducing concentrations below harmful concentrations. The use of chaff would not increase under Alternative 1 from that under the No Action Alternative. Chaff would not affect water or sediment quality, as described under the No Action Alternative.

TALDs used during training exercises would expend 24 thermal batteries per year. Thermal batteries would have effects on the marine environment similar to those of lithium batteries. Most of the hazardous materials in batteries would be consumed during activation. The steel casing would become encrusted through natural processes, further slowing any leaching of hazardous materials. This amount of expended batteries would not be expected to affect the marine environment.

The use of EMATTs for ASW exercises would deposit 120 lb (56 kg) of expended lithium batteries per year in the TMAA. As described in Section 3.2.1.1, lithium batteries would not have substantial effects on marine conditions because most of the chemical components are abundant in seawater. The leaching rate of chemicals through the steel casing would be further slowed by encrusting from benthic organisms and natural processes. Thus, Under Alternative 1, no measurable impact on the environment would occur from the use of targets and countermeasures.

Naval Gun Shells

Under Alternative 1, there would be a 25-percent increase in expended shells compared to the No Action Alternative. HE shells would slightly increase to 56 shells from 40 under the No Action Alternative. Alternative 1 would deposit 13,800 lb (6,270 kg) of expended materials per year on the ocean floor, an

increase of 28 percent over the No Action Alternative. Approximately 1,650 lb (750 kg) of this material would be hazardous. Hazardous materials would be heavy metals in projectiles and residual explosives, but any effect would be limited to the immediate surroundings of the expended round.

Approximately 1,500 lb of hazardous materials from expended shells would be tungsten in CIWS 20-mm projectiles. Tungsten alloys in 20-mm rounds would not be expected to substantially affect marine water or sediment quality because the 20-mm rounds would have an areal density of less than 1.2 rounds per nm^2 (0.34 per km^2). Hazardous materials are discussed in detail in Section 3.2.1.1. This amount of hazardous materials would have an insignificant effect on marine resources. Given the inert nature of the majority of expended materials and the wide distribution across the training area, Alternative 1 would not have a measurable impact on the environment.

Small Arms Rounds

Under Alternative 1, 14 percent more small-caliber rounds (from 5,000 to 5,700 rounds) would be expended per year compared to the No Action Alternative. Expended small arms round would result in approximately 210 lb (95 kg) of expended material, but hazardous materials would only account for approximately 2.1 lb (0.9 kg) of the annually expended materials. Hazardous materials are discussed in detail in Section 3.2.1.1. Leached lead and antimony would increase the concentration of toxic chemicals in the immediate vicinity of expended small-caliber rounds, but these substances would quickly be dispersed by ocean and tidal currents. Given the generally inert nature of these materials, their low amounts of hazardous materials, their small size, and their wide distribution across the TMAA, the increase under Alternative 1 would not have a measurable impact on the environment.

Sonobuoys

Alternative 1 would introduce new ASW training exercises to the TMAA. ASW training would introduce a new target (MK-39 EMATT) and new types of sonobuoys. Table 3.2-16 summarizes the types and numbers of sonobuoys proposed for use under Alternative 1.

Table 3.2-16: Types and Numbers of Sonobuoys – Alternative 1

Type of Sonobuoy	Number of Items		Increase under Alternative 1 (%)
	Alternative 1	No Action Alternative	
SSQ-36 BT (passive)	60	24	150
SSQ-53 DIFAR (passive)	500	0	NA
SSQ-62 DICASS (active)	133	0	NA
SSQ-77 VLAD (passive)	60	0	NA
SSQ-110A IEER (explosive) or SSQ-125 AEER (Tonal)	40	0	NA
Total number used	**793**	**24**	**3,200**
Total weight (lb)	**30,900**	**936**	**3,200**

Notes: Numbers and weights of training items are estimates, and weights and percentages are rounded to three significant digits, NA = Not applicable. IEER - Improved Extended Echo Ranging Sonobuoy. AEER - Advanced Extended Echo Ranging Sonobuoy

Under Alternative 1, 793 sonobuoys would be expended annually. An even distribution of expended training materials over 20 percent of the TMAA would result in approximately 0.1 expended sonobuoys per nm^2 per year. Sonobuoys used during training would result in approximately 30,900 lb (13,900 kg) of expended material. Their annual density by weight would be about 3.7 lb per nm^2 (0.5 kg per km^2). The hazardous materials in the expended sonobuoys would weigh approximately 2,340 lb (Table 3.2-17).

Table 3.2-17: Hazardous Materials Content of Expended Sonobuoys – Alternative 1

Constituent	Hazardous Material Weight (lb)		Increase under Alternative 1 (%)
	Alternative 1	No Action Alternative	
Copper thiocyanate	1,260	38.1	3,200
Fluorocarbons	15.9	0.48	3,200
Copper	270	8.16	3,200
Lead	745	22.6	3,200
Tin/lead plated steel	47.6	1.44	3,200
Total	2,340	70.8	3,200

There would be a substantial increase in hazardous materials under Alternative 1, but the density would remain low (approximately 0.28 lb per nm^2 [0.04 kg per km^2] per year). This level of deposition of expended sonobuoys would have a minimal impact on ocean water resources under Alternative 1. Lead concentrations would not be expected to exceed USEPA standards because of the large area within which sonobuoys would be deployed and the dilution of leached lead by ocean currents. Detonation byproducts from explosive sonobuoys used under Alternative 1 would not have a substantial impact because of the large training area and the low number of explosive sonobuoys used during training exercises.

Electronics liquids used in the sonobuoy compass would release small amounts of fluorocarbons into the marine environment (Table 3.2-12). The volume of ocean water surrounding expended sonobuoys would dilute fluorocarbons to non-toxic concentrations (less than 1,000 mg/L). Although fluorocarbons are resistant to degradation, they would not be expected to concentrate in any areas of the TMAA.

Expended batteries would not substantially affect the marine environment because most of the hazardous constituents are consumed during use. Sonobuoy batteries would represent the greatest release of copper from expended materials because copper thiocyanate would be soluble. The peak concentration of copper released from a cuprous thiocyanate seawater battery was calculated to be 0.015 µg/L (DoN 1993), which would be substantially lower than USEPA acute and chronic toxicity criteria. While the copper thiocyanate battery also would release cyanide, a material often toxic to marine organisms, the amount of copper thiocyanate in sonobuoys would be very low. Thiocyanate would be tightly bound, and would form a salt or bind to bottom sediments. The concentration of available thiocyanate released from sonobuoys would be similar to the concentration of copper, which would be below the USEPA's maximum acute and chronic toxicity for free cyanide (1 µg/L; USEPA 2006). Therefore, the risk from thiocyanate would be very low. The remaining hazardous materials would slowly leach, and would quickly be dispersed by ocean currents, resulting in concentrations of hazardous materials below harmful concentrations.

Portable Undersea Training Range

The PUTR would require the installation of seven anchors for the electronic components. Upon completion of training, these anchors would remain on the ocean floor. Each anchor weighs approximately 300 lb, which would result in approximately 2,100 lb of expended materials. Anchors would be made of concrete or sand bags, which would be covered by sand or sediment over time. There would be no hazardous materials associated with anchors and, thus, there would be minimal effects on the marine environment.

Summary –Alternative 1 Effects

Under Alternative 1, 20,223 items would be expended each year, with a deposition rate of 2.40 items per nm^2 (0.69 items per km^2) per year (see Table 3.2-13). Over 93 percent of the expended items would be naval gun shells or small arms rounds. Under Alternative 1, Navy training exercises would result in

approximately 143,000 lb (65,000 kg) of expended materials per year in the TMAA. The density of expended materials distributed over 20 percent of the TMAA would be about 16.9 lb per nm^2 (2.23 kg per km^2) per year. Assuming Navy training under Alternative 1 would remain consistent over periods of five and 20 years, the Navy would expend approximately 358 tons (84.8 lb per nm^2 [11.2 kg per km^2]) and 1,430 tons (339 lb per nm^2 [44.7 kg per km^2]) in the TMAA, respectively. Most of these materials would be relatively inert in the marine environment, but would degrade slowly.

Only a small amount of expended materials would be considered hazardous (Table 3.2-14). Alternative 1 would result in an increase in the hazardous material of about 160 percent, but would only deposit approximately 0.58 lb per nm^2 (0.08 kg per km^2) of hazardous material across 20 percent of the TMAA. The majority of these materials would be residual explosives, which break down slowly. Any leaching chemicals would be quickly dispersed by ocean currents, and would not be expected to result in harmful concentrations. Thus, expended materials under Alternative 1 would not substantially affect marine resources.

3.2.2.6 Alternative 2

Table 3.2-1 summarizes the types of training items that could present issues related to hazardous materials under Alternative 2. The numbers and weights of materials expended annually under Alternative 2 are provided in Table 3.2-18 and Table 3.2-19. Additionally, Alternative 2 would include two SINKEX events, with one occurring during each Carrier Strike Group exercise. During SINKEX, a decommissioned surface ship is towed to a deep-water location and sunk using a variety of ordnance. Each SINKEX event may include the use of one MK-48 ADCAP torpedo, which is only used at the end of SINKEX if the target is still afloat. The following discussion compares the numbers and types of training materials that would be expended annually under Alternative 2, the Preferred Alternative, to those under the No Action Alternative.

Table 3.2-18: Numbers and Weights of Expended Training Materials – Alternative 2

Type of Training Material	Quantity of Training Materials				Increase under Alternative 2 (%)	
	Alternative 2		No Action Alternative			
	Number	Weight (lb)	Number	Weight (lb)	Number	Weight
Bombs	360	160,000	120	54,000	200	200
Missiles	66	20,300	22	6,770	200	200
Targets/Pyrotechnics	644	11,200	252	3,610	160	210
Naval gun shells	26,376	27,500	10,564	10,700	150	160
Small arms rounds	11,400	420	5,000	180	130	130
Sonobuoys	1,587	61,900	24	936	6,500	6,500
PUTR	7	2,100	0	0	NA	NA
SINKEX[1]	858	70,000	0	0	NA	NA
Total	**41,298**	**352,000**	**15,982**	**76,200**	**160**	**360**

Notes: Weights of expended materials are estimates, and weights and percentages are rounded to three significant digits. (1) Due to the variability in weight of available ship hulks, the expended weight for SINKEX does not incorporate ship hulks, NA = Not applicable

Bombs

Under Alternative 2, an additional 240 bombs, for a total of 360, would be used per year, a 200-percent increase over the No Action Alternative. Approximately 160,000 lb (72,000 kg) of bombs would be deposited on the ocean floor. This level of deposition would result in a density of approximately 19 lb per nm^2 (2.5 kg per km^2) of expended material per year over 20% of the TMAA. Eighty-two percent of the bombs would be inert, and the small amount of explosives contained in the spotting charge would be minimal. The amount of hazardous materials expended would increase from 390 lb per year under the No Action Alternative to 1,130 lb per year under Alternative 2. Alternative 2 would deposit approximately 0.13 lb per nm^2 (0.02 kg per km^2) per year of hazardous material in the TMAA. Hazardous materials are

discussed in detail in Section 3.2.1.1. Explosives would leach slowly, and ocean currents would disperse leaching materials. Hazardous materials from bombs would be spread over a large area, and would break down. Explosive material would not accumulate on the ocean floor. Although this level of deposition would be a measureable increase over the No Action Alternative, the low areal density of hazardous materials would not be expected to affect water or sediment quality in the TMAA. Given the potential impacts of expended bombs under the No Action Alternative, this increase would have no measurable impact on the environment.

Table 3.2-19: Expended Materials Considered Hazardous – Alternative 2

Type of Training Material	Weight of Material (lb)[1]		Hazardous Content (%)
	Total Expended	Hazardous	
Bombs	160,000	1,130	0.70
Missiles	20,300	169	0.83
Targets and pyrotechnics	11,200	381	3.40
Naval gun shells	27,500	3,310	12.0
Small-caliber rounds	420	4.20	1.00
Sonobuoys	61,900	4,680	7.56
PUTR	2,100	0	0
SINKEX	70,000	850	1.25
Total	**352,000**	**10,500**	**2.98**

Notes: Weights of expended materials are estimates, and are rounded to three significant digits. (1) Weights of hazardous materials are based upon available information, and may not include hazardous weight of all expended materials, NA = Not applicable

Missiles

Under Alternative 2, an additional 44 missiles (66 total) per year would be used over the No Action Alternative, a 200-percent increase. The weight of expended materials from missiles would increase at the same rate, resulting in 20,300 lb (9,140 kg) of expended materials from missiles, or 2.4 lb per nm^2 (0.3 kg per km^2), deposited per year in the TMAA. Hazardous material would make up 169 lb [77 kg] per year of the expended material from missiles. The density of hazardous materials would be approximately 0.02 lb per nm^2 (less than 0.01 kg per km^2). Hazardous materials would consist of explosives from dud missiles and missile propellants. Hazardous materials are discussed in detail in Section 3.2.1.1. Explosives from missiles would not be expected to affect water or sediment quality because of the small amount of hazardous material and its low density within the training area. Since most missiles (approximately 50 percent) would not employ explosive warheads, the increase over the No Action Alternative would not have measurable effects on the TMAA marine environment.

Targets and Pyrotechnics

Table 3.2-20 shows the types and numbers of targets and pyrotechnics that would be used annually under Alternative 2.

Seventy-nine percent of the targets and pyrotechnics used under Alternative 2 would not be recovered. Unrecovered targets would deposit approximately 11,200 lb (5,040 kg) per year of expended materials in the TMAA. The density of expended targets and pyrotechnics within the affected areas would be approximately 1.3 lb per nm^2 (0.2 kg per km^2). Of the unrecovered expended materials, a large portion (about 68 percent) of expended materials would be pyrotechnics, which are mostly consumed by chemical reactions. Most of the expended materials would be relatively inert in the marine environment, with only 380 lb (170 kg) per year of expended materials considered to be hazardous, consisting of approximately 130 lb (59 kg) of residual pyrotechnic materials and 250 lb (113 kg) of batteries from EMATTs per year.

This annual increase in the amounts of hazardous materials deposited in the TMAA would be expected to have minimal effects on the marine environment because of its density (0.05 lb per nm^2 [less than 0.01 kg per km^2]). Hazardous materials would be dispersed by ocean currents, and would not be expected to be at harmful concentrations.

Table 3.2-20: Targets and Pyrotechnics – Alternative 2

Type of Target or Pyrotechnic	Number of Items		Increase Under Alternative 2	
	Alternative 2	No Action Alternative	Numerical	Percent (%)
Targets				
TDU-34 towed target	6	2	4	200
TALD*	24	8	16	200
BQM-74E unmanned aircraft	4	2	2	100
Killer Tomato surface target	24	10	14	140
SPAR	24	10	14	140
MK-39 EMATT*	40	0	40	NA
Pyrotechnics				
LUU-2B/B*	36	12	24	200
MK-58 Marine Marker*	120	20	100	500
Chaff*	424	212	212	100
Total number used	**702**	**276**	**426**	**150**
Total not recovered	**644**	**252**	**392**	**160**
Total expended weight (lb)	**11,200**	**3,610**	**7,610**	**210**

Notes: * Not recovered, NA = Not applicable. Percentages are estimates, and are rounded to two significant digits

TALD targets would not be recovered after training exercises. Under Alternative 2, TALDs would result in 48 expended thermal batteries per year (information on weight of batteries was not available). The effects of thermal batteries would be similar to those identified for lithium batteries. Batteries may contain hazardous materials, but would not be expected to have an effect on the marine environment because most hazardous constituents would be consumed during battery activity. Remaining hazardous materials would be leached slowly through the steel shell, and would not result in harmful concentrations because leached materials would be dispersed quickly by ocean currents.

Under Alternative 2, 1,080 lb (490 kg) of chaff would be used per year, an increase of 100 percent from the No Action Alternative. Chaff is generally nontoxic, and relatively inert in the marine environment. The constituents of chaff and their environmental fates are described in Section 3.2.1.1. Most of the remaining targets and countermeasures would be recovered after use, and these are constructed of mostly inert materials. Should they be lost at sea, they would become buried in bottom sediments or wash up onshore. Under Alternative 2, no measurable impact on the marine environment would result from expended chaff within the TMAA.

Naval Gun Shells

Under Alternative 2, the number of gun shells used would increase from 10,564 shells per year in the No Action Alternative to 26,376 shells per year under Alternative 2. The number of HE shells would increase from 40 under the No Action Alternative to 112 under Alternative 2. Alternative 2 would deposit 27,500 lb (12,500 kg) per year of expended materials on the ocean floor, with approximately 3,310 lb (1,500 kg) per year of that material considered to be hazardous. Approximately 3,000 lb (1,360 kg) of hazardous

materials from expended shells would be tungsten in CIWS 20-mm projectiles. Hazardous materials are discussed in detail in Section 3.2.1.1.

This amount of material would be expected to have negligible effects on the marine environment because effects would be limited to the immediate vicinity of the expended rounds. Annual increases in the amounts of hazardous materials would not cause harmful concentrations of heavy metals in the surrounding water column because of their low density (0.39 lb per nm^2 [0.05 kg per km^2]) and dispersal of leaching material by ocean currents. Tungsten rounds would not have substantial effects on the marine environment because expended 20-mm rounds would have an areal density of approximately 2.4 rounds per nm^2 (0.69 rounds per km^2). Given the inert nature of these materials and their wide distribution across the study area; these increases would not have measurable effects on the environment.

Small Arms Rounds

Alternative 2 would increase the deposition rates of small arms rounds by 130 percent, from 5,000 to 11,400 rounds per year. Expended small arms rounds would weigh 420 lb (190 kg). Hazardous materials would account for approximately 4.2 lb (1.9 kg) per year of expended small arms materials. Hazardous materials from small arms rounds would have a negligible effect on the marine environment. Hazardous materials are discussed in detail in Section 3.2.1.1. Leached lead and antimony would increase the concentrations of toxic chemicals in the immediate vicinity of expended small-caliber rounds, but these substances would quickly be dispersed by ocean and tidal currents. Given the relatively inert nature of these materials, with the exceptions of lead and antimony, their small size, and their wide distribution across the study area, this increase would have no measurable impact on the environment.

Sonobuoys

Under Alternative 2, 1,587 sonobuoys would be used per year. Assuming deposition of expended materials over 20 percent of the TMAA, the increase in their annual density would be approximately 0.2 sonobuoy per nm^2 (0.1 per km^2). Sonobuoys expended during training would deposit approximately 61,900 lb (27,900 kg) of material within the TMAA each year. About 4,680 lb (2,108 kg) of expended sonobuoys would be considered hazardous materials, which would result in approximately 0.56 lb per nm^2 (0.07 kg per km^2) of hazardous material per year. Hazardous materials are discussed in detail in Section 3.2.1.1. Table 3.2-21 compares the types and numbers of sonobuoys proposed under Alternative 2 to those under the No Action Alternative. Table 3.2-22 provides the weights of hazardous constituents for sonobuoys used under Alternative 2.

Under Alternative 2, there would be a 6,500-percent increase in the amount of expended and hazardous materials from sonobuoys. However, this level of deposition of sonobuoys would have a minimal impact on marine environment because of the low density of hazardous materials (less than one lb per nm^2) per year. These materials would leach slowly, and would not result in harmful concentrations because of dispersion by ocean currents. Hazardous materials are discussed in detail in Section 3.2.1.1. As previously discussed for the No Action Alternative and Alternative 1, expended sonobuoys and their hazardous constituents would not result in adverse effects on the marine environment.

Table 3.2-21: Types and Numbers of Sonobuoys – Alternative 2

Type of Sonobuoy	Number of Items		Increase under Alternative 2 (%)
	Alternative 2	No Action Alternative	
SSQ-36 BT	120	24	400
SSQ-53 DIFAR (passive)	1,000	0	NA
SSQ-62 DICASS (active)	267	0	NA
SSQ-77 VLAD (passive)	120	0	NA
SSQ-110A IEER (explosive) or SSQ-125 AEER (Tonal)	80	0	NA
Total number used	**1,587**	**24**	**6,500**
Total weight (lb)	**61,900**	**936**	**6,500**

Notes: Numbers and weights of training items are estimates, and weights and percentages are rounded to three significant digits, NA = Not applicable

Table 3.2-22: Hazardous Materials from Expended Sonobuoys – Alternative 2

Constituent	Hazardous Material Weight (lb)		Increase under Alternative 2 (%)
	Alternative 2	No Action Alternative	
Copper thiocyanate	2,520	38.1	6,500
Fluorocarbons	31.7	0.48	6,500
Copper	540	8.16	6,500
Lead	1,490	22.6	6,500
Tin/lead plated steel	95.2	1.44	6,500
Total	**4,680**	**70.8**	**6,500**

Portable Undersea Training Range

Under Alternative 2, PUTR would require the same number of anchors (seven) to be placed on the ocean floor as under Alternative 1. Anchors would be made of concrete or sand, and would not contain any hazardous materials. Any effects on the marine environment would be the same as under Alternative 1.

SINKEX

Under Alternative 2, two SINKEX would occur, with one occurring with each summertime activity. Table 3.2-23 provides a list of ordnance used during SINKEX.

Ordnance use during SINKEX would vary, based on training requirements and training conditions. For example, a MK-48 ADCAP torpedo would only be used at the conclusion of SINKEX if the target vessel was still afloat. This analysis assumes that the greatest number of each type of ordnance would be used during 2 SINKEX events under Alternative 2. Therefore, an estimated 858 ordnance items would be expended annually during 2 SINKEX events under Alternative 2.

Table 3.2-23: Ordnance Expended Annually during SINKEX Events

Ordnance Category	Ordnance Type	Number of Items
Missiles	AGM-65 Maverick	6
	AGM-84 Harpoon	10
	AGM-88 HARM	4
	AGM-114 Hellfire	2
	AGM-119 Penguin	2
	Standard Missile-1	2
	Standard Missile-2	2
Bombs	MK-82 (inert)	6
	MK-82 (live)	14
	MK-83	8
Naval Gun Shells	5-in gun shells	800
Torpedoes	MK-48 ADCAP torpedo	2
Targets	Surface Ship Hulk	2
	Total	**858**
	Total Expended Weight (lb)	**70,000[1]**
	Total Hazardous Weight (lb)	**850**

Notes: Numbers are cumulative for two separate SINKEX events.(1) Due to the variability in weight of available ship hulks, the total expended weight does not incorporate ship hulks

These expenditures would result in approximately 70,000 lb (31,500 kg) per year of expended materials. These materials would be used in a small area, resulting in a high density of expended materials, relative to other training events. For example, if each SINKEX activity were contained within 8 nm^2 (assuming an 8-hour event and a 1.0-nm-per-hour current), then the density of deposited materials on the ocean floor would be about 4,238 lb (1,926 kg) per nm^2. Each year, two of these relatively high-density areas of expended training materials would be created.

Most of these expended training materials would be relatively inert, with approximately 850 lb (380 kg) per year of hazardous material, or approximately 425 lb (190 kg) per SINKEX event. Hazardous materials from expended ordnance would be residual explosives, propellant, and heavy metals (mostly lead). In the past, vessels used for SINKEX had most of the solid PCBs removed, leaving estimates of up to 100 lb of PCBs on board each vessel when sinking took place (USEPA 1999). These materials would be in solid forms, and would leach slowly because of their low solubility. Ocean currents would disperse leaching materials to non-toxic concentrations. Therefore, this amount of hazardous materials would not be expected to affect the marine environment.

Under Alternative 2, two MK-48 ADCAP torpedoes would be expended during SINKEX events. Most of the expended material would be relatively inert in the marine environment. Hazardous materials information on MK-48 ADCAP torpedoes is confidential, but torpedoes (in general) could contain explosives, heavy metals, and propellants (OTTO Fuel II). Explosives and propellant would be mostly consumed during torpedo activation and detonation. Heavy metals would be in solid forms, and would leach at a slow rate because of natural processes (encrusting). The low number of torpedoes used under Alternative 2 would not result in substantial effects to the marine environment.

Alternative 2 would expend two surface vessels per year during SINKEX events. For SINKEX, the vessels used as targets are selected from a list of U.S. Navy approved vessels that have been cleaned in accordance with USEPA guidelines. By rule, SINKEX can only be conducted at least 50 nm (93 km) offshore and in water at least 6,000 feet (1,830 m) deep (40 CFR §229.2). USEPA considers the contaminant levels that would be released during the sinking of a target to be within the standards of the

Marine Protection, Research, and Sanctuaries Act (16 U.S.C. 1341, et seq.). As with other inert materials, the vessel would become encrusted by chemical processes and biological organisms. Therefore, vessels used as targets would not pose a hazard to ocean water resources.

Summary –Alternative 2 Effects

Under Alternative 2, there would be an increase in the number and weight of expended materials in the TMAA. Over 91 percent of the expended items would be naval gun shells or small arms rounds. The weight of expended materials under Alternative 2 would increase to 352,000 lb (160,000 kg) per year (360-percent increase over the No Action Alternative), with the largest percentage increase from expended sonobuoys. Navy training under Alternative 2 would deposit approximately 41 lb of expended material per nm^2 (5.4 kg per km^2) per year over 20 percent of the TMAA. Assuming Navy training under Alternative 2 would remain consistent over periods of five and 20 years, the Navy would expend approximately 880 tons (209 lb per nm^2 [27.5 kg per km^2]) and 3,520 tons (835 lb per nm^2 [110 kg per km^2]) of training material in the TMAA, respectively. Expended bombs would account for most of the weight of expended materials, but the majority of this weight would be relatively inert material used as filler for practice bombs, such as concrete or sand. Under Alternative 2, approximately 10,500 lb (4,770 kg) per year of hazardous material would be expended (Table 3.2-19). Assuming deposition of expended materials on 20 percent of the TMAA, the density of deposited hazardous materials would be approximately 1.2 lb per nm^2 (0.2 kg per km^2) per year.

Alternative 2 would also include up to two SINKEX training activities per year. Materials expended annually during both SINKEXs are provided in Table 3.2-23. Target vessels expended during training would be cleaned according to USEPA standards, and would be relatively inert in the marine environment. Approximately 70,000 lb (31,500 kg) of ordnance would be expended annually, with approximately one percent consisting of hazardous materials. The majority of materials expended during SINKEX training would be inert in the marine environment. Solid PCBs would be removed to the maximum extent practicable, but some vessel materials with PCBs would remain on board when the vessel in sunk (approximately 100 lb per vessel [USEPA 1999]). SINKEX training would result in a relatively high areal density of expended and hazardous materials, within those portions of the TMAA used for this activity, compared to the overall areal density within the TMAA that would result from all other training exercises under Alternative 2.

3.2.3 Mitigation

As summarized in Section 3.2.4, the alternatives would contribute small amounts of hazardous materials to the environment. Given the large size of the training area and the expected fate and transport of the constituents, hazardous materials released to the environment by the Proposed Action are not likely to be present at detectable concentrations. Current Navy protective measures, such as hazardous waste management procedures, identified in Section 3.2.1.2, would continue to be implemented. No additional mitigation measures would be required under the Preferred Alternative.

3.2.4 Summary of Effects

Table 3.2-24 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 in terms of expended materials, including hazardous materials, under both NEPA and EO 12114.

Table 3.2-24: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	Executive Order 12114 (Non-U.S. Territorial Seas, >12 nm)
No Action Alternative	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). No significant impacts related to expended materials will occur. • Aircraft overflights will not involve expenditures of training materials.	• Approximately 76,200 lb (34,600 kg) of training materials will be expended per year, with a density of 9.0 lb per nm^2 (1.2 kg per km^2) per year. Over 97 percent of the expended items will be naval gun shells or small arms rounds. • Approximately 1,870 lb (850 kg) of hazardous materials would be distributed at an estimated 0.22 lb per nm^2 (0.03 kg per km^2) per year. • Expended materials under the No Action Alternative will not have a substantial effect on the environment.
Alternative 1	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). No significant impacts related to expended materials would occur. • Aircraft overflights would not involve expenditures of training materials.	• Increase in training would deposit approximately 143,000 lb (65,000 kg) of expended materials, with a density of 16.9 lb per nm^2 (2.23 kg per km^2) per year. Over 93 percent of the expended items would be naval gun shells or small arms rounds. • Approximately 4,890 lb (2,220 kg) of hazardous materials would be distributed at an estimated 0.58 lb per nm^2 (0.08kg per km^2) per year. • Expended materials under Alternative 1 would not have a substantial effect on the marine environment.

Table 3.2-24: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	Executive Order 12114 (Non-U.S. Territorial Seas, >12 nm)
Alternative 2 (Preferred Alternative)	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). No significant impacts related to expended materials would occur. • Aircraft overflights would not involve expenditures of training materials.	• There would be an increase in the weight of expended materials (352,000 lb [160,000 kg]). Over 91 percent of the expended items would be naval gun shells or small arms rounds. • Hazardous materials would account for 2.98 percent (10,500 lb [4,770 kg]) per year of expended material, but density of these materials would be approximately 1.2 lb per nm^2. • SINKEX training would result in approximately 70,000 lb per year of expended materials, of which one percent would be considered hazardous. SINKEX would result in a relatively high areal density of expended materials on portions of the TMAA. • Expended materials under Alternative 2 would not have a substantial effect on the marine environment.

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3.3 Water Resources

3.3 WATER RESOURCES

3.3.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for water resources consists of the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999) and the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

In general, water resources include the following components:

- Water bodies, including lakes, ponds, rivers, groundwater, the ocean, and transitional areas such as wetlands and estuaries;
- Water processes, including ocean currents, seasonal changes in precipitation and resulting runoff, percolation from surface to aquifers, and biological, physical, and chemical changes that occur as water moves through the hydrologic cycle;
- Water uses, including drinking, recreation, commerce such as transportation and fishing, and plant and animal habitat;
- Water quality, including the chemical and physical composition of groundwater and fresh and marine surface waters, as affected by natural conditions and human activities; and
- The topography of the ocean bottom (bathymetry) that influences currents and sediment movement.

3.3.1.1 Ocean Water Resources

Alaska's water resources, including the GOA, are generally in pristine condition because of the low intensity of use in this remote area (U.S. Environmental Protection Agency [USEPA] 2004). Marine water resources in the study area are affected by ocean currents, climate and weather patterns, and bathymetry. Ocean currents influence conditions in the study area by altering surface water temperatures, transporting and depositing sediments, and concentrating or diluting the resources on which marine life depends. Similarly, prevailing winds change with the season and alter the movement of surface waters. During spring and summer, southerly winds push surface waters away from the coast and bring cold, nutrient-rich waters from deeper areas, a process known as upwelling. These processes sustain active fisheries for a variety of fish and marine invertebrates, influence weather patterns and the hydrologic cycle of much of the western United States, and play a vital role in the economy of many coastal communities.

Pacific Ocean

The TMAA is located in the Northeast Pacific Ocean off the mountainous coast of southern Alaska. The temporary boundaries of TMAA form a roughly rectangular area oriented from northwest to southeast, approximately 300 nautical miles (nm) (556 kilometers [km]) long by 150 nm (278 km) wide, situated south of Prince William Sound and Kenai Peninsula and east of Kodiak Island. Covering approximately 42,146 square nautical miles (nm^2) (145,482 square kilometers [km^2])of ocean, the TMAA spans both coastal and deepwater habitats ranging from approximately 426 feet (ft) (130 meters [m]) to over 12,000 ft (3,660 m) in depth. The GOA forms a large, semicircular bight opening southward into the North Pacific Ocean. The GOA is characterized by a broad and deep continental shelf containing numerous troughs, seamounts, and ridges. The region receives high amounts of freshwater input, experiences

numerous storms, and exhibits highly variable environmental conditions (Department of Navy [DoN] 2006).

Continental Shelf

The GOA shoreline is bordered by a deep continental shelf subject to persistent coastal downwelling. The GOA continental margin is extremely irregular, having been shaped by glacial forces, plate tectonics, and ocean currents. Bottom depths along the shelf range from 490 ft to 660 ft (150 to 200 m). The continental shelf encompasses approximately 1.1×10^5 nm^2 (3.7×10^5 km^2) of ocean floor. The width of the continental shelf varies from 3 to 110 nm (5 to 200 km) at different points along the GOA (DoN 2006).

Seamounts

Seamounts are isolated underwater mountains rising 3,000 to 10,000 ft (900 to 3,000 m) above the surrounding ocean bottom. Seamounts are found in all oceans, but are most numerous in the Pacific Ocean, which has over 2,000. The significant seamounts in the TMAA are the Dall, Pratt, Giacomini, Ely, Quinn, and Surveyor Seamounts (Figure 3.3-1). These seamounts, except for Dall Seamount, are part of the Kodiak-Bowie Seamount chain, which is a chain of extinct volcanoes that formed over the Bowie Hotspot as the tectonic plate shifted. Seamounts provide a unique habitat for both deep-sea and shallow-water organisms because of their large ranges of depth, hard substrate, steep vertical gradients, convoluted surfaces, variable currents, clear oceanic waters, and geographic isolation. Upwelling often occurs around seamounts because currents push cold water from the depths up the slopes of the seamounts, bringing fresh nutrients to the surface.

Submarine Canyons

Submarine canyons have steep walls, winding valleys, narrow V-shaped cross-sections, steps, and considerable irregularity along the sea floor. Many troughs and canyons in the GOA transect the continental shelf (DoN 2006). They are the flooded remains of terrestrial canyons cut by large rivers fed by glacial meltwater. The floors of submarine canyons are primarily mud, with isolated sandy patches. Currents flowing through submarine canyons transport sediment from the coast to the deep ocean, forming sediment fans where they open to the abyssal plain.

The major troughs within the TMAA, Stevenson and Amatuli, are located on the eastern edge of Kodiak Island. These troughs are broad, U-shaped valleys that extend from near the shoreline to the shelf break. All of the troughs are relatively straight, running in a northwest to southeast orientation, and are often located between two broad submarine banks. The troughs along Kodiak Island range in depth from 490 ft to 980 ft (150 m to 300 m). The slope of the ocean floor in these troughs is gradual, rarely exceeding two degrees (DoN 2006).

The Aleutian Trench runs along the shelf margin in the Gulf of Alaska and is one of the deepest portions of the eastern North Pacific. It stretches from the southern coastline of Alaska to waters of the northeastern coast of Siberia. The trench is approximately 2,000 nm (3,700 km), with an average width of 27 nm (50 km) and a maximum depth of 25,300 ft (7,700 m) (DoN 2006). The Aleutian Trench is a tectonic subduction zone, where the Pacific Plate is subducted under the North American Plate.

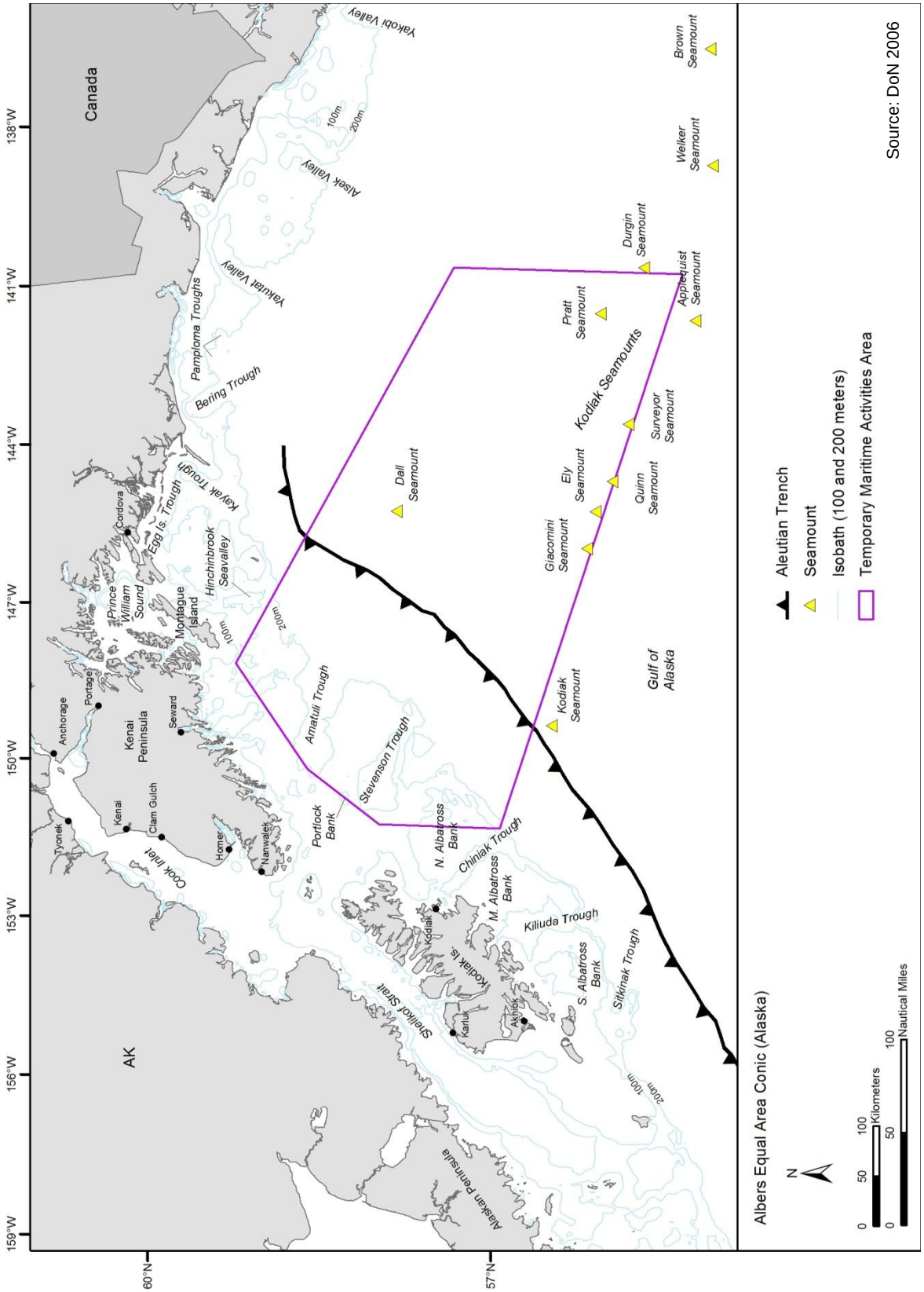


Figure 3.3-1: Major Geological Features of the TMAA and Vicinity

Abyssal Plain

The abyssal plain is a relatively flat area of the deep ocean floor beyond the foot of the continental slope. Depths vary from 9,800 to 16,000 ft (3,000 to 5,000 m) (DoN 2006). The abyssal plain is relatively flat and featureless because fine-grained sediments, mostly silt and clay, have filled in the originally uneven surface of oceanic crust. Most of this sediment is deposited by currents that have been channeled from the continental margins along submarine canyons. The remainder of the sediment is dust blown out to sea from land and the remains of small marine plants and animals that sink from the upper layer of the ocean, known as pelagic sediment.

Climate

The GOA remains ice-free for the entire year, with the warmest sea surface temperatures in August and the coldest sea surface temperatures in February and March. Portions of bays and inlets may be covered by ice or may have floating glacial ice during the coldest months.

El Niño

El Niño Southern Oscillation (El Niño) events affect the GOA; these events can initiate large shifts in global climate, atmospheric circulation, and oceanographic processes. El Niño conditions typically last 6 to 18 months, but can persist for longer periods. El Niño events cause global changes over time scales of months to years. El Niño is caused by the interannual changes in sea level pressures between the eastern and western hemispheres of the tropical Pacific Ocean. The trade winds weaken in the central and western Pacific Ocean, and cause the normal east-to-west surface water transport to decrease. The result is a rise in the sea surface temperature across the mid- to eastern Pacific Ocean (DoN 2006).

La Niña

La Niña is the opposite phase of El Niño in the Southern Oscillation cycle, and is usually associated with the opposite climatic effects. La Niña is characterized by strong trade winds that push the warm surface waters back across to the western Pacific Ocean. Under these conditions, along with increased upwelling along the eastern Pacific Ocean coastline, the thermocline in the eastern Pacific Ocean becomes shallower (DoN 2006). (The thermocline is that portion of the water column between a relatively warm surface zone and a colder deep-water zone, in a thermally stratified [layered] body of water, where the temperature decreases rapidly with increasing depth).

Arctic Oscillation

The Arctic Oscillation (AO), which affects the GOA, varies based on atmospheric changes in the polar region and mid-latitudes. It varies between negative and positive phases on a decadal scale. The negative phase generally consists of higher-than-normal pressure over the polar region, while the positive phase consists of intense low pressure (USEPA 2004). The low-pressure system results in stormy weather, with high winds and increased precipitation, as well as elevated sea levels and warmer water temperatures. Under these conditions, the wind-induced cross-shelf transport and the Alaska Coastal Current (ACC) increase (DoN 2006).

Ocean Currents

The general ocean circulation in the GOA is dominated by the counter-clockwise Alaska Gyre, centered at approximately 52º to 53º north (N) and 145º to 155º west (W). The Gyre includes the Alaska Current (AC), the Alaskan Stream (AS), and the North Pacific Current (NPC). Nearshore flow is dominated by the ACC (DoN 2006).

North Pacific Current

The NPC, also called the West Wind Drift, flows along the southern boundary of the GOA at a velocity of 2 to 6 inches per second (in/sec) (5 to 15 centimeters per second [cm/sec]). The NPC originates in northern Japan, and flows eastward toward North America. The NPC diverges off of the western coast of North America; the northward flow becomes the AC, while the southward flow becomes the California Current. Along the Aleutian Islands, some water from the AS re-circulates into the NPC (DoN 2006).

Alaska Current

The AC is a northward-flowing, warm-water current offshore of the continental shelf. The AC is broad, 54 to 220 nm (100 to 400 km) wide, and highly variable. It is the dominant transport system of surface waters in the GOA. The AC flows adjacent to the coast of North America at velocities between 30 and 100 cm/sec (DoN 2006). The AC frequently meanders and eddies along the shelf break, most frequently in the fall. Eddies propagate shoreward as the AC proceeds north, with troughs or trenches from the shelf break creating clockwise eddies toward shore (DoN 1993). These eddies cause a variety of ocean currents near the edge of the continental shelf. The AC flows northward along the coast of Alaska to the head of the GOA, where the current follows the curve of the shoreline and forms the AS. Shifts in regional climate also can play a role in the AC. For example, during an El Niño event, the AC destabilizes, increasing the variability in flow volume and direction (DoN 2006).

The AC originates in the western Pacific Ocean, and marine pollution and floating refuse from Asia, from open ocean dumping and from accidents at sea, can be swept northward and westward around the shelf edge in the GOA. Trash from the international fishing industry operating 200 miles offshore is commonly found on beaches in the region (DoN 2006).

Alaska Coastal Current

The ACC is the primary element of shelf circulation in the GOA. This current originates along the continental shelf of British Columbia. In some years, however, the ACC may start as far south as the Columbia River. The ACC flows west throughout the year along the inner third of the continental shelf, which is approximately 19 nm (35 km) from shore. It is fed by winds, runoff from glaciers, snowmelt, rainfall, and freshwater discharge. The width, speed, and depth of the ACC vary with location along the coast. Late fall and early winter are periods of maximum transport because of accumulated freshwater discharge and strong winds. ACC velocities may exceed 39 in/sec (100 cm/sec) during this period. Minimum transport occurs in the early summer, prior to the spring melt, when local wind stress is weak. The ACC provides a sizeable and ecologically important transition zone between the nearshore and oceanic communities (DoN 2006).

Alaskan Stream

The AS, which forms at the head of the GOA, is the extension of the AC, and flows westward along the Alaska Peninsula. The AS is narrow (185 nm [100 km]) and swift (18 to 48 in/sec [45 to 123 cm/sec]), affecting the upper 1,600 ft (500 m) of the water column. Periods of low pressure during the AO affect the velocity of the AS; velocities increase northeast of Kodiak Island and decrease southwest of the island (DoN 2006).

Ocean Water Parameters

Ocean water parameters of interest include temperature, salinity, dissolved oxygen, nutrients, and alkalinity (pH). These parameters influence the rates of chemical and biological processes and the mobility of various substances, such as dissolved metals.

Temperature

The GOA can be generally characterized by two surface temperature regimes throughout the year. Relatively warm surface water occurs over the continental shelf, while colder water is found farther offshore beyond the shelf break. Surface temperatures within the AC vary by approximately 20 degrees Fahrenheit (°F) (10 degrees Celsius [°C]) throughout the year. On the inner shelf, mean monthly sea surface temperatures (SSTs) range from approximately 38°F (3.5°C) in March to 57°F (14°C) in August. Across the shelf, changes in SSTs are generally small (approximately 4°F [2°C]). The overall difference in annual temperature diminishes with depth, with the annual range being only 2°F (1°C) at depths greater than 490 ft (150 m). During winter, intense circulation over the GOA produces easterly coastal winds and downwelling, which results in a well-mixed water column over the continental shelf. Stratification develops during summer because of decreased winds, increased freshwater discharge, and increased solar radiation (DoN 2006).

Anomalous warmer SSTs in the GOA often are associated with El Niño events. El Niño events do not always result in an immediate shift in SSTs in the North Pacific Ocean; SST anomalies were detected in the region one year after the onsets of the 1976, 1982, 1986, and 1992 El Niño events. During positive AOs, the GOA experiences above-average SSTs. Negative AOs result in below-average SSTs (DoN 2006).

Salinity

The North Pacific Ocean is less saline than the North Atlantic Ocean. Fresh water entering the North Pacific Ocean inhibits the development of deep water masses, which affects oceanic heat transport. The annual average fresh water influx is approximately 8.1×10^5 cubic feet per second (ft^3/sec) (23,000 cubic meters per second [m^3/sec]). This runoff enters the marine environment through many small drainage systems. The discharges peak in early fall and decrease rapidly during winter, when precipitation is stored as snow. A secondary runoff peak occurs in spring and summer from snowmelt in the region. This discharge, approximately 20 percent greater than the mean annual Mississippi River discharge, accounts for nearly 40 percent of the freshwater flows into the GOA. The phasing and magnitude of these freshwater flows are important, because salinity primarily affects horizontal and vertical density gradients in the northern GOA. Seasonal variability in the upper layers of the offshore Alaska Gyre reflects the effects of wind-induced mixing and heat exchange with the atmosphere (DoN 2006).

The vertical salinity structure of the GOA and Alaska Gyre consists of a seasonally varying upper layer extending from the surface to approximately 330 ft (100 m) depth, a halocline (a strong, vertical salinity gradient) that extends from 330 ft to 660 ft (100 m to 200 m) depth, where the salinity increases from 33 to 34 practical salinity units (psu), and a deep layer extending to approximately 3,300 ft (1,000 m), where the salinity increases slowly to 34.4 psu. Beneath the deep layer, the salinity increases gradually to a maximum value of approximately 34.7 psu at the ocean bottom. The halocline is a permanent feature of the subarctic North Pacific Ocean. It is formed by the high rates of precipitation and runoff, in conjunction with large-scale circulation processes of the North Pacific Ocean. The strong density gradient of the halocline limits vertical exchange between the saline and nutrient-rich deep water and the upper layer (DoN 2006).

During the winter, salinities in the upper layer of ocean water range from 32.5 to 32.8 psu. The upper layer in the northern GOA is less saline and colder than the upper layer in the southern GOA. During spring, the upper layer gradually becomes less saline and warms because wind speeds decrease and solar heating increases. Salinities reach a minimum of approximately 25 psu in August. Decreasing wind speeds allow intrusion of high salinity waters from the oceanic regions of the GOA onto the shelf. The summer mixed layer includes a weak secondary halocline, a vertical salinity gradient, centered at approximately 98 ft (30 m) depth. As atmospheric cooling and wind-mixing increase in fall, the seasonal

water density gradient erodes rapidly and the physical properties of the upper layer revert to winter conditions (DoN 2006).

Dissolved Oxygen, Nutrients, and pH

The major chemical parameters of marine water quality include dissolved oxygen, nutrient concentrations, and pH. The major ions present in seawater include sodium, chloride, potassium, calcium, magnesium, and sulfate.

Surface waters are usually saturated or supersaturated with dissolved oxygen as a result of photosynthetic activity and wave mixing. Below the surface, dissolved oxygen generally remains between 0.4 and 0.6 milliliter per liter (mL/L). Anaerobic (no oxygen) conditions are found in bottom sediments and at the water-sediment interface in deep ocean basins (Dailey et al. 1993).

Nutrients are chemicals or elements necessary to produce organic matter. In marine systems, basic nutrients include dissolved nitrogen, phosphates, and silicates. Dissolved inorganic nitrogen occurs in ocean water as nitrates, nitrites, and ammonia, with nitrates as the dominant form. The nitrate concentration of nearshore water varies from 0.1 to 10.0 micrograms per liter (µg/L). The lowest concentrations typically occur in summer. At a depth of 33 ft (10 m), the concentration of phosphate ranges from 0.25 to 1.25 µg/L, while the concentration of silicate ranges from 2.0 to 15 µg/L (Dailey et al. 1993).The marine environment has relatively stable pH (between 7.5 and 8.5) because of the presence of dissolved elements, particularly carbon and hydrogen. Most of the carbon in the sea is present as dissolved inorganic carbon that originates from the complex interaction of dissolved carbon dioxide (CO_2) and water. This CO_2-carbonate equilibrium system is the major buffering system in seawater, meaning that it keeps pH stable.

Existing Ocean Water Quality

There is little information on open ocean water quality, but some studies suggest that deep water is generally of higher quality than surface waters. Water quality in the marine environment is determined by complex interactions between physical, chemical, and biological processes. Physical processes include regional currents and tidal flows, seasonal weather patterns and temperature, sediment characteristics, and unique local conditions.

Chemical processes involve salinity, pH, dissolved minerals, oxygen, nutrient levels, and pollutants. Biological processes involve the influence of living things on the physical and chemical environment, such as the uptake, conversion, and excretion of materials during growth, reproduction, and decomposition. These processes operate and interact continuously, creating a dynamic system. Changes in these conditions alter the viability of habitat at certain locations and water depths to various organisms. For instance, excessive nutrients (eutrophication) can lead to algal blooms, subsequent die-offs, and declines in dissolved oxygen (hypoxia) to the point where fish can no longer survive.

Contaminants found in marine environments include suspended solids, sediment, nutrients and organic materials, metals, synthetic organic compounds such as pesticides and plastics, and pathogens. The sources of these contaminants include commercial and recreational vessels, oil spills, industrial and municipal discharges (point source pollution), legal and illegal ocean dumping, poorly or untreated sewage, and runoff from urban and agricultural areas (nonpoint source pollution). Conduits for contamination include streams, rivers, and air currents that carry materials from inland areas to the sea. Alaska coastal resources are generally considered to be pristine because of the low population density and the distance of most of its coastline from major urban and industrial areas (USEPA 2004).

Potential pollutants should be viewed in the context of their "bioavailability," that is, the capacity of material to be taken up by living organisms through physical contact or ingestion. Factors that influence bioavailability include the ocean water parameters noted previously (i.e., temperature, salinity, dissolved oxygen, nutrients, and pH). In sediments, bioavailability is influenced by particle size, organic carbon content, the presence of iron oxyhydroxides and iron sulphides, and the presence of other metals.

Ocean Sediment Parameters

A variety of ocean floor sediment compositions are found within the GOA. Sediment types include gravely sand, silty mud, muddy to sandy gravel, and hard rock. The northeastern GOA continental shelf is mainly composed of clay silts from the Copper River or glacial deposition. The western area has steep slopes and visible scouring. There are many banks and reefs with primarily coarse or rocky bottoms, while basins and other depressions may accumulate bottom sediments (U.S. Department of Commerce, National Oceanic and Atmospheric Administration [USDC, NOAA] 2005).

The mountains surrounding the GOA are geologically young, and provide plentiful sources of sediment to the marine environment. Glacial scouring of the underlying bedrock also provides an abundance of fine-grained sediments to the Gulf of Alaska shelf and basin. The Bering and Malaspina glaciers are major sources of glacial sediments in the Gulf of Alaska. The Alsek and Copper Rivers in the northern GOA, and the Knik, Matanuska, and Susitna Rivers that feed Cook Inlet all contribute sediment as well (DoN 2006). The majority of rivers along the Pacific Coast drain small, steep watersheds that produce large amounts of sand-sized sediment. Submarine canyons are major conduits for sediment transport to the open ocean. The remainder of the sediment is composed of dust blown out to sea from land, and the remains of small marine plants and animals that sink from the upper layer of the ocean. The Continental Rise in the eastern GOA is an accumulation of sediments from the continental shelf; these fine sediments are generally transported west.

Existing Ocean Sediment Quality

Several factors influence the extent and severity of sediment contamination in aquatic systems. Fine-grained (less than 0.63 micrometer [µm]), organic-rich sediments bind some toxicants, such as heavy metals, so strongly that their threat to organisms is greatly reduced. Conversely, these fine-grained sediments are also easily resuspended and transported to distant locations. Thus, silty sediments high in total organic carbon are potential sources of contamination. But such statements do not apply equally to all potential pollutants. Metals such as lead and large organic molecules such as polycyclic aromatic hydrocarbons and polychlorinated biphenyls tend to remain in sediments. More soluble chemicals tend to remain as ions in the pore water surrounding the sediments (Canadian Forces Maritime Experimental and Test Ranges [CFMETR] 2005). At this time, there are no data on sediment quality within the TMAA.

3.3.1.2 Current Requirements and Practices

At sea, Navy vessels are required to operate in a manner that minimizes or eliminates any adverse impacts on the marine environment. Environmental compliance policies and procedures applicable to shipboard operations afloat are defined in Chief of Naval Operations Instruction (OPNAVINST) 5090.1C, Chapter 3, "Pollution Prevention," and Chapter 19, "Environmental Compliance Afloat" (DoN 2007a); Department of Defense (DoD) Instruction 5000.2-R (§C5.2.3.5.10.8, "Pollution Prevention"). In addition, provisions in Executive Order (EO) 12856, *Federal Compliance With Right-To-Know Laws and Pollution Prevention Requirements*, and EO 13101, *Greening the Government through Waste Prevention, Recycling, and Federal Acquisition* reinforce the prohibition in the Clean Water Act (CWA) against discharge of harmful quantities of hazardous substances into or upon U.S. waters out to 200 nm (371 km), and mandate stringent hazardous waste discharge, storage, dumping, and pollution prevention requirements. Table 3.3-1 provides information on Navy Standard Operating Procedures and Best Management Practices for shipboard management, storage, and discharge of hazardous materials and

wastes, and on other pollution protection measures intended to protect water quality. Onshore policies and procedures related to spills of oil and hazardous wastes are detailed in OPNAVINST 5090.1C, Chapter 12. (DoN 2007a).

Shipboard waste-handling procedures governing the discharge of nonhazardous waste streams have been established for commercial and Navy vessels. These categories of wastes include solids (garbage) and liquids such as "black water" (sewage), "gray water" (water from deck drains, showers, dishwashers, laundries, etc.), and oily wastes (oil-water mixtures). Table 3.3-1 summarizes the waste stream discharge restrictions for Navy vessels at sea.

Table 3.3-1: Waste Discharge Restrictions for Navy Vessels

Zone (nm from shore)	Type of Waste	
	Black Water (Sewage)	**Gray Water**
U.S. Waters (0-3 nm)	No discharge.	If vessel is equipped to collect gray water, pump out when in port. If no collection capability exists, direct discharge permitted.
U.S. Contiguous Zone (3-12 nm)	Direct discharge permitted.	Direct discharge permitted.
>12 nm from shore	Direct discharge permitted.	Direct discharge permitted.
Zone	**Oily Waste**	
U.S. Waters (0-3 nm)	Discharge allowed if waste has no visible sheen. If equipped with Oil Content Monitor (OCM), discharge < 15 parts per million (ppm) oil.	
U.S. Contiguous Zone (3-12 nm)	Same as 0-3 nm.	
>12 nm from shore	If equipped with OCM, discharge < 15 ppm oil. Vessels with oil/water separator but no OCM must process all bilge water through the oil-water separator.	
Zone	**Garbage (Plastic)**	**Garbage (Non-plastic)**
U.S. Waters (0-3 nm)	No discharge.	No discharge.
U.S. Contiguous Zone (3-12 nm)	No discharge.	Pulped or comminuted food and pulped paper and cardboard waste may be discharged >3nm
12-25 nm from shore	No discharge.	Bagged shredded glass and metal waste may be discharged >12nm[1]
> 25 nm from shore	No discharge	Direct discharge permitted[2]

Note: (1) Submarines may discharge compacted, sinkable garbage between 12 nm and 25 nm provided that the depth of water is greater than 1,000 fathoms.
(2) Surface ships shall use pulpers and shredders for all discharges of food products, paper, cardboard, glass and metal wastes

Source: DoN 2007a

In 1990, Congress enacted the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (Title I of Public Law 101-646; 16 United States Code [U.S.C.] §§4701, et seq.), which established a federal program to prevent the introduction and to control the spread of unintentionally introduced aquatic nuisance species and gave the U.S Coast Guard jurisdiction over ballast water management. In 1996, the

National Invasive Species Act amended the Nonindigenous Aquatic Nuisance Prevention and Control Act to create a national ballast management program modeled after the Great Lakes program wherein all ships entering U.S. waters (after operating outside the U.S. Exclusive Economic Zone) are directed to undertake high seas (i.e., mid-ocean) ballast exchange or alternative measures pre-approved by the Coast Guard as equally or more effective. When the National Invasive Species Act amended the Nonindigenous Aquatic Nuisance Prevention and Control Act in 1996, 16 U.S.C. 4713 was added, which indicated that the DoD was to establish its own ballast water management program for seagoing vessels of the Department of Defense. Additionally, the Clean Water Act was amended in 1996 to allow for the Secretary of the Defense and Administrator of the USEPA to work in consultation with the U.S. Coast Guard and interested states to determine discharges incidental to the normal operation of a vessel of the Armed Forces for which it is reasonable and practicable to require use of a marine pollution control device.

On May 10, 1999, USEPA and DoD published the final rule establishing regulations for undertaking to establish the Uniform National Discharge Standards for Vessels of the Armed Forced. This rule completed the first phase of a three-phase process to set the Uniform National Discharge standards. This Phase I rule determined the type of vessel discharges that require control by marine pollution control devices and those that do not, based on anticipated environmental effects of the discharge as well as factors listed in the Clean Water Act. A total of 25 vessel discharges that could cause an adverse impact on the environment requiring control standards have been identified under Phase I of the program (Federal Register 64[89], 25126-25138). Dirty ballast was one of the types of incidental discharges identified to require a marine pollution control device in Phase I. Phase II involves developing performance standards and control procedures for those discharges. The Navy and USEPA have agreed to promulgate Phase II standards in batches. The batch rulemaking approach allows the Navy and USEPA to conduct technical analyses and develop discharge standards in batches (approximately five discharges per batch) rather than conducting analyses and developing standards for all 25 discharges at one time. To date, this Phase II process is still ongoing.

Therefore, since Navy ships operate worldwide, the Navy has chosen to adopt the intent of the U.S. Coast Guard standards with respect to ballast water management even though U.S. Coast Guard regulations exempt vessels of the Armed Forces that are subject to the Uniform National Discharge Standards from the ballast water guidelines. Under Navy policy, if it is necessary for a surface ship to load ballast water in an area that is either potentially polluted or within three nm from the shore, the ship will pump the ballast water out when outside 12 nm (22 km) from shore and twice fill the tanks with clean sea water and pump prior to the next entry within 12 nm (22 km) from shore. It is also Navy policy to not exchange ballast water during local operations (within the same locale) or when returning within 12 nm (22 km) in the same locale as the ballast water was initially loaded. Surface ships maintain records of all ballast water exchanges. In addition, surface ships routinely wash down anchors, chains, and appendages to prevent on board collection of sediment, mud, and silt. Where possible, following anchor retrieval, surface ships wash down chain lockers outside 12 nm (22 km) from land to flush out sediment, mud, or silt.

3.3.2 Environmental Consequences

The ROI for water resources includes the GOA TMAA (Section 3.3.1). Navy training activities within Air Force inland Special Use Airspace and Army inland training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) are analyzed in this EIS/OEIS pursuant to EO 12114.

3.3.2.1 Previous Analyses

Impacts related to water resources were previously evaluated in Section 3.1 of the *Alaska Military Operations Area EIS* (USAF 1995); Section 3.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007); Sections 3.8, 3.9, 4.8, and 4.9 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999); and Sections 3.5, 3.6, 4.5, and 4.6 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.3.2.2 Regulatory Framework

Marine ecosystems in the study area developed around, and are sustained by, the chemical, physical, and biological processes and the seasonal patterns in each environment. The health of these systems, as well as human use of the water resources in the study area, is monitored and protected by international, federal, State, and local laws and regulations. The following subsections describe the legal and regulatory framework applicable to military training activities in the GOA. International, federal, and State regulations on solid waste and hazardous materials are described in Section 3.2, Expended Materials.

International

MARPOL 73/78, the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978, is the primary international marine environmental convention. MARPOL 73/78 is designed to minimize pollution from ships. It contains six major annexes or sections: I-Oil, II-Noxious Liquid Substances in Bulk, III-Harmful Substances Carried by Sea in Packaged Form, IV-Sewage from Ships, V-Garbage from Ships, and VI-Air Pollution from Ships. Discharges from ships are restricted within specified distances from shore. On the open seas, natural bacterial action is considered adequate for dealing with raw sewage. The U.S. is not party to Annex IV-Sewage from Ships (USEPA 2009); however, the Navy regulates discharges from vessels under OPNAVINST 5090.1C (Table 3.3-1).

Federal

The principal federal law protecting water quality is the Federal Water Pollution Control Act, more commonly known as the CWA (33 U.S.C. 1251 et seq.), which is enforced by the USEPA. In addition, NOAA oversees coastal and marine water resources under CWA, the Coastal Zone Management Act (CZMA), the Marine Plastic Pollution Research and Control Act (MPPRCA), and the Oil Pollution Act (OPA). NOAA also is responsible for managing and protecting coastal and marine habitats through its National Marine Fisheries Service (NMFS).

Clean Water Act

The goal of the CWA is to restore and maintain the chemical, physical, and biological integrity of the nation's waters, including coastal and marine waters. The USEPA establishes National Ambient Water Quality Criteria (USEPA 2006) for priority and non-priority pollutants. These criteria for aquatic life and human health include both seawater and freshwater concentrations. These criteria are published for enforcement through Section 304(a) of the CWA. Various CWA sections govern point sources and nonpoint sources of pollution. Oil and hazardous substances are regulated by CWA §311 out to the boundary of the contiguous zone.

Coastal Zone Management Act

The federal CZMA (16 U.S.C. 1451, et seq.) is a voluntary state-federal partnership that encourages states to adopt programs that meet federal goals of protecting and restoring coastal zone (CZ) resources, including protecting coastal waters from nonpoint source pollution (16 U.S.C. 1455[b]). The program is administered by NOAA. The CZMA requires participating coastal states to develop management programs that demonstrate how they will carry out their obligations and responsibilities in managing their

coastal areas. Upon federal approval of a state's coastal zone management program, the state benefits by becoming eligible for federal CZ grants. Activities that occur in the CZ or affect CZ resources are regulated by the adjoining state after federal approval of its coastal zone management plan. The state also gains review authority over certain federal activities in the CZ, and the consistency of those activities with the CZ management plan.

Marine Plastic Pollution Research and Control Act

The MPPRCA of 1987 (33 U.S.C. §§ 1901 et seq.) regulates the discharge of garbage, primarily plastics, into the ocean. Under this federal statute, the discharge of any plastic materials (including synthetic ropes, fishing nets, plastic bags, and biodegradable plastics) into the ocean is prohibited. The discharge of other materials, such as floating dunnage (cargo packing materials), food waste, paper, rags, glass, metal, and crockery, is also regulated by the MPPRCA. Ships are permitted to discharge these types of refuse depending on their distance from shore. It is illegal to dump most garbage within 3 nm of shore. From 3 to 12 nm (5.6 to 22 km), it is illegal to dump plastic or any garbage greater than one inch (in) in size. It is illegal to dump dunnage and plastics within 12 to 25 nm (22 to 46 km) of shore. An additional component of the MPPRCA requires that all ocean-going, U.S.-flagged vessels greater than 40 ft (12.2 m) in length or manned, fixed, or floating platforms subject to U.S. jurisdiction keep records of garbage discharges and disposals.

Oil Pollution Act

The OPA (33 U.S.C. §§ 2701 et seq.), passed in 1990, increased the protection of our nation's oceans by amending the CWA and including new policies relating to oil spill prevention and cleanup methods. The OPA provides regulations for the prevention of the discharge of oil into the ocean waters out to the limits of the contiguous zone (out to 25 nm). Any party that is responsible for a vessel, offshore facility, or deepwater port that could cause an oil spill must maintain proof of financial responsibility for potential damage and removal costs. OPA identifies the parties that are liable in a variety of oil spill circumstances and what damage and removal costs must be paid. The President has the authority to use the Oil Spill Liability Trust Fund to cover these costs when necessary. Any cost for which the fund is used must be in accordance with the National Contingency Plan, which is an oil and hazardous substance pollution prevention plan established by the CWA. Federal, state, Indian tribe, and foreign trustees must assess the natural resource damages that occur from oil spills in their trusteeships, and develop plans to restore the damaged natural resources. The Act also establishes an Interagency Coordinating Committee on Oil Pollution Research to research and develop plans for natural resource restoration and oil spill prevention.

Marine Protection, Research, and Sanctuaries Act

The Marine Protection, Research, and Sanctuaries Act (MPRSA) of 1972, also known as the Ocean Dumping Act, regulates materials dumped into ocean waters that could endanger human health, welfare, and amenities, and the marine environment, ecological systems, and economic possibilities. The Ocean Dumping Act regulates the disposal of any material in the U.S. territorial seas or contiguous zones, as well as the marine disposal anywhere of waste and other material that originated in U.S. territory or was transported on U.S.-registered vessels or aircraft.

The Navy currently holds a General Permit for Sinking Exercise (SINKEX) activities from the USEPA under the MPRSA(40 CFR §229.2, Transport of Target Vessels). This MPRSA permit allows the Navy to transport vessels in ocean waters for the purpose of sinking the vessel. Pursuant to the MPRSA permit, vessel sinkings must be conducted in water at least 6,000 ft (1,830 m) deep and at least 50 nm (93 km) from land. Regulations require that measures be taken to ensure that the vessel sinks to the bottom rapidly and permanently, and does not pose a hazard to marine navigation. In addition, the MPRSA permit requires the appropriate measures be taken to remove, to the maximum extent practicable, all materials that may degrade the marine environment. This includes, but is not limited to, emptying all fuel tanks and

fuel lines to the lowest point practicable and removal of trash, floatable materials, and mercury or fluorocarbon containing materials capable of contributing to chemical pollution. The August 1999 SINKEX Letter of Agreement between USEPA and the Navy created additional measures to the MPRSA permit, which are described in Section 3.2, Expended Materials, for removal of materials that may degrade the marine environment.

State and Local

Navy training in the TMAA occurs more than 12 nm (22 km) from shore, which is beyond the State of Alaska's regulatory jurisdiction. Therefore, State and local regulations on water quality do not apply to Navy training in the TMAA. The following section is provided only for informational purposes.

Water Quality and Pollution Standards

State regulation of water quality is enforced by the Alaska Department of Environmental Conservation (ADEC). The ADEC establishes water quality standards, which may not be consistent with USEPA standards, for enforcement through the Water Quality Standards program. State standards focus on specific water constituents that affect water quality in Alaska. These standards are used to enforce the CWA, but are not effective until approval by USEPA. Protected classes of water bodies are identified in 18 Alaska Administrative Code 70.020, where marine water supply, recreation, propagation of aquatic life and wildlife, and harvest and consumption of raw mollusks and other raw wildlife are all considered under the Water Quality Standards program. The marine water quality standards address fecal coliform bacteria, dissolved gases, petroleum hydrocarbons, oil, grease, and other constituents.

Sediment Management Standards

Alaska does not have a sediment quality management program. Due to the extensive shoreline, very little sediment testing is conducted on a regional scale. The State has begun researching cost-effective methods for testing sediment quality, but no actions have been taken. No State standards have been developed.

Coastal Zone Management

The Alaskan Legislature enacted the Alaska Coastal Management Act in 1977 (Chapter 84 State Legislature of Alaska 1977), which established the Alaska Coastal Management Plan (ACMP). The CZ extends from 3 nm (5.6 km) offshore to inland areas necessary to control the shoreline, and where land uses would have a substantial effect on coastal resources. The ACMP addresses a variety of issues, including the sustainability of fisheries, impacts of mining, transportation needs and impacts, and other areas of concern within the CZ. The Alaska Department of Natural Resources is the primary authority for the ACMP. Twenty-eight of Alaska's 33 coastal districts are revising their plans to be consistent with the new enforceable policies, updated in 2003 and 2005. The ACMP is described and its applicability to Navy training in the TMAA is discussed in Section 1, Purpose and Need of the Proposed Action.

3.3.2.3 Approach to Analysis

Data Sources

A systematic review of relevant literature was conducted to complete this analysis of water resources in the study area, including journals, DoD reports and operational manuals, natural resource management plans and other technical reports published by government agencies, prior environmental documents for facilities and activities in the study area, and work conducted by private businesses and consulting firms.

Assessment Methods

For each alternative, this document characterizes and quantifies the total amount of training materials, both hazardous and nonhazardous, that are expended annually during Navy training in the TMAA. This

analysis does not include materials expended during Navy training in the inland lands of the GOA because those activities are covered by Army and Air Force documents identified in Section 3.3.2.1. Hazardous material weights and leaching rates are based on assumptions identified in Section 3.2.1.1 for each expended training material.

This analysis assumes that expended training materials are deposited on 20 percent of the available training area (TMAA) (DoN 2009). The TMAA consists of an ocean area of approximately 42,146 nm^2 (145,482 km^2). Deposition of expended materials over 20 percent of the training area would affect an area of approximately 8,430 nm^2 (29,100 km^2). This is a conservative assumption that is based on Navy personnel experience, which indicates that the distribution of training exercises within ocean training areas is not uniform.

Aircraft overflights occur under all of the alternatives. Aircraft overflights between the TMAA and the Alaska inland training areas would not involve expenditures of training materials. Therefore, aircraft overflights in the GOA will not be addressed further in this section.

3.3.2.4 No Action Alternative

This section analyzes the circumstances under which water quality in the TMAA could be affected by expended materials during training under the No Action Alternative. The No Action Alternative is the baseline for Navy training in the TMAA. Under the No Action Alternative, training exercises are conducted once per year for a short period (up to 14 days). Potential impacts on water quality will result from expended training materials in the marine environment. Expended materials that contain hazardous constituents may affect water quality because hazardous materials can be released during use (i.e. combustion byproducts), directly deposited into the marine environment (i.e. residual explosive material), or leach from expended materials after deposition. Expended training materials may contain several sources of hazardous chemicals, such as missiles that contain heavy metals, propellant, batteries, and explosives. The following section addresses substances of concern, the training materials in which they are found, and their potential impacts on water quality. Detailed analyses of expended and hazardous materials, their possible pathways for insertion into the marine environment, and their environmental fates are provided in Section 3.2, Expended Materials.

This analysis assumes that 99 percent of expended training materials are deposited on 20 percent of the available training area (DoN 2009). This is a conservative assumption that is based on Navy personnel experience, which indicates that the distribution of training activities within sea training areas is not uniform. The TMAA is an ocean area of approximately 42,146 nm^2 (145,482 km^2). Twenty percent of the TMAA is approximately 8,430 nm^2 (29,100 km^2).

Aircraft overflights occur under all of the alternatives. Aircraft transiting between the TMAA and Alaska inland training areas would not expend any training materials. Therefore, aircraft overflights associated with Navy training in the GOA will not be further addressed in this section.

Heavy Metals

Heavy metals are present in vessels, manned and unmanned aircraft, bombs, shells, missiles, bullets, sonobuoys, batteries, and electronic components, and as anticorrosion compounds coating exterior surfaces (e.g., missiles, vessels). Heavy metals that may be present in expended materials include lead, antimony, brass, copper, nickel, chromium, and cadmium. The USEPA recommends application of a 24-hour acute limit and 4-day chronic limit. Neither limit can be exceeded more than once every 3 years, on the average. Water quality criteria for several pollutants expected to result from expended materials during Navy training are provided in Table 3.3-2.

Fuels and Propellants

Hazardous chemicals include fuels and other propellants, and combustion byproducts of those fuels and propellants (Section 3.2, Expended Materials). These materials are present in or may be generated by the use of aircraft, vessels, and self-propelled machines such as Expendable Mobile Anti-Submarine Warfare (ASW) Training Targets (EMATTs) and unmanned aerial vehicles.

Table 3.3-2: Threshold Values for Safe Exposure to Selected Metals

Metal	Criteria (µg/L)	
	Acute (24-hr exposure)	Chronic (4-day mean exposure)
Lead	210	8.1
Silver	1.9	n/a
Copper	4.8	3.1
Cadmium	40	8.8
Nickel	74	8.2
Silver	1.9	n/a
Lithium[1]	6,000	n/a

n/a = no chronic value is available; µg/L = micrograms per liter; hr = hour
(1) No USEPA criteria available; values shown are based on literature (Kszos et al. 2003)
Source: USEPA 2006

Explosives

Explosives are contained in live bombs, missiles, and one type of sonobuoy. Most new military explosives are mixtures of plastic or other polymer binders and Royal Demolition Explosive (RDX, cyclotrimethylene trinitramine) or High Melting Explosive (cyclotetramethylene tetranitramine). Pentaerythritol tetranitrate is used in blasting caps, detonation cord, and similar initiators of explosions. Explosives that fail to function as designed (duds) or are low-order detonations result in residual explosives. Dud and low-order detonation rates are discussed in Section 3.2, Expended Materials.

Non-Hazardous Expended Materials

Non-hazardous expended materials include the parts of a device that are made of nontoxic metals (e.g., steel, iron, aluminum) or polymers (e.g., nylon, rubber, vinyl, and various other plastics); as well as glass and concrete. These materials are used in inert bombs, inert shells, and targets. While these items represent persistent seabed litter, they do not chemically contaminate the environment by leaching heavy metals or organic compounds because of their strong resistance to degradation and their chemical composition. Most of these objects will settle to the bottom. There they will lodge in deep sediments and eventually be covered by sediment. The expended materials may become coated by corrosion (e.g., rust on metal surfaces) or encrusted by marine organisms (e.g., coral), slowing chemical leaching. Therefore, these materials are not subject to further analysis.

Other Factors Influencing Marine Water and Sediment Quality

The open ocean and nearshore environments are complex and dynamic systems of physical, chemical, and biological components. These components continually influence each other, and are also influenced by other factors. This complexity can make accurately identifying the source of a particular material or predicting the ultimate fate of specific materials expended during training a challenge. For example:

- Many contaminants are conveyed into marine systems by the wind or by surface runoff, such as from rivers.

- Once training materials are deposited, natural physical, chemical, and biological processes can re-suspend, transport, and redeposit these materials in areas far removed from their original source.
- The properties of seawater, such as temperature, salinity, pH, dissolved oxygen concentration, and hardness, affect the mobility and the toxicity of contaminants. The presence of other substances in seawater, such as extremely small particles (< 0.63 µm), bicarbonates, sulfides, phosphates, and other metals, also affect the mobility and the toxicity of contaminants.

Materials Expended During Training in the TMAA – No Action Alternative

Table 3.3-3 summarizes the number of items, the weight of expended materials, and the weight of hazardous materials that will be deposited on the ocean floor in the TMAA.

Table 3.3-3: Training Materials Expended Per Year – No Action Alternative

Type of Training Material	Number of Items	Weight of Material (lb)		Hazardous Content (%)
		Expended Materials	Hazardous Materials	
Bombs	120	54,000	395	0.73
Missiles	22	6,770	56.4	0.83
Targets and pyrotechnics	252	3,610	27.2	0.75
Naval gun shells	10,564	10,700	1,320	12.3
Small arms rounds	5,000	180	1.80	1.00
Sonobuoys	24	936	70.8	7.56
Total	**15,982**	**76,200**	**1,870**	**2.45**

Note: Weights of expended and hazardous materials are estimates, and are rounded to three significant digits.

Bombs

Approximately 120 bombs per year will be expended in the TMAA under the No Action Alternative, resulting in approximately 54,000 pounds (lb) (24,300 kilograms [kg]) of expended materials. Assuming a distribution of expended materials over 20 percent of the TMAA, the deposition rate of expended bombs will be approximately 6.4 lb of material per nm^2 (0.83 kg per km^2) per year. Bombs used during training exercises will deposit approximately 395 lb (180 kg) per year of hazardous materials (residual explosives and heavy metals). This rate will increase the amounts of hazardous materials deposited in the TMAA by less than 0.05 lb per nm^2 (less than 0.01 kg per km^2) per year. The majority of bombs (60 percent) will be inert. They will settle to the ocean bottom, and become encrusted by chemical processes and marine organisms. Inert bombs may contain explosive spotting charges. The amounts will be small, however, and will be consumed upon contact with land or water. Therefore, inert bombs will present no hazard to ocean water resources. Live bombs will have no measurable impact on ocean water resources because most of their hazardous constituents will be consumed upon detonation and a low percentage (approximately 3.37 percent [Rand 2005]) would be duds.

Missiles

Table 3.3-4 describes the types of explosives and propellants for selected types of missiles used in the TMAA under the No Action Alternative.

In general, the single largest hazardous constituent of missiles is solid propellant, such as solid double-base propellant, aluminum and ammonia propellant grain, and arcite propellant grain. The solid propellant is primarily composed of rubber (polybutadiene) mixed with ammonium perchlorate. Hazardous constituents, such as Plastic Bonded Explosive (PBX) high-explosive (HE) components, PBX-106 explosive, and PBX (AF)-108 explosive, are also used in igniters, explosive bolts, batteries (potassium

hydroxide and lithium chloride), and warheads. Testing has demonstrated that water penetrates only 0.06 in (0.15 cm) into solid propellants during the first 24 hours of immersion, and that fragments will very slowly release ammonium and perchlorate ions (DoN 2007a). These ions will be rapidly diluted and disperse in the surrounding water such that local concentrations will be extremely low.

Table 3.3-4: Explosives and Propellants in Selected Missiles – No Action Alternative

Type of Missile	Number Expended	Type of Propellant
AIM-7 Sparrow	6	Propellant is dual-thrust, solid-fuel rocket motor (Hercules MK-58); warhead is an 88-lb (40 kg) WDU-27/B blast-fragmentation device.
AIM-9 Sidewinder	8	Propulsion system contains up to 44 lb (20 kg) of solid double-base propellant; warhead contains approximately 10 lb (4.5 kg) of PBX HE.
AIM-120 AMRAAM	6	Propellant is solid-fuel rocket motor (ATK WPU-6B booster and sustainer with RS hydroxyl-terminated polybutadiene (solid propellant fuel); warhead contains 40 lb (18 kg) of HE.
RIM-67A Standard Missile-1	2	Propellant is a two-stage, solid-fuel rocket (MK-30 sustainer motor and a Hercules MK 12 booster); warhead contains 137 lb (62 kg) of HE.

Source: Global Security 2008a

Another concern is when ordnance does not function correctly—it either does not detonate ("dud") or does not detonate completely (low-order detonation), and some of the explosive remains. As with propellants, these materials can release small amounts of hazardous materials into the water as they degrade and decompose. Table 3.3-5 provides a list of these items.

Table 3.3-5: Ordnance Constituents of Concern

Training Ordnance	Constituent of Concern
Pyrotechnics, Tracers, and Spotting charges	Barium chromate and Potassium perchlorate
Oxidizers	Lead oxide
Delay Elements	Barium chromate, Potassium perchlorate, and Lead chromate
Propellants	Ammonium perchlorate
Fuses	Potassium perchlorate
Detonators	Fulminate of mercury and Potassium perchlorate
Primers	Lead azide

Source: United States Army Corps of Engineers 2007

Twenty-two missiles will be used annually under the No Action Alternative, and no missiles will be recovered after training exercises. The total weight of missiles expended will be 6,770 lb (3,050 kg) each year. If deposited on 20 percent of the training area, this will be a deposition rate of 0.8 lb per nm^2 (0.1 kg per km^2) per year. Approximately 56.4 lb (25.6 kg) of expended missile material (approximately 38 lb [17 kg] of residual explosives and 18 lb [8.1 kg] of residual propellant) would be considered hazardous. Residual explosives and solid propellants will slowly leach hazardous substances, but would not result in concentrations considered to be harmful. Missile casings are relatively inert, and will corrode in the marine environment. Corrosion and benthic organisms will encrust the missile body, further slowing degradation. Thus, expended training materials will not impact water resources.

Targets and Pyrotechnics

Table 3.3-6 summarizes the types and numbers of targets and pyrotechnics that will be used in the TMAA under the No Action Alternative. About 276 targets and pyrotechnics will be used annually during training exercises, and 252 (91 percent) will not be recovered after training use. Twenty marine markers and 12 LUU-2B/B illuminating flares will be used, and will be mostly consumed as heat and smoke during use. Approximately 27 lb (12 kg) of residual pyrotechnic material will be expended in the TMAA per year during Navy training. Pyrotechnics make up 97 percent of the unrecovered targets and pyrotechnics.

Table 3.3-6: Types and Numbers of Targets and Pyrotechnics – No Action Alternative

Type of Target or Pyrotechnic	Number of Items
Targets	
TDU-34 towed target	2
Tactical Air-Launched Decoy (TALD)*	8
BQM-74E unmanned aircraft	2
Killer Tomato surface target	10
SPAR	10
Pyrotechnics	
LUU-2B/B*	12
MK-58 Marine Marker*	20
Chaff*	212
Total number used	**276**
Total not recovered	**252**
Total Expended Weight (lb)	**3,610**

*Not recovered

Under the No Action Alternative, 540 lb (245 kg) of chaff will be used per year. All components of the aluminum coating are present in seawater in trace amounts, except magnesium, which is present at 0.1 percent. The stearic acid coating is biodegradable and nontoxic. The potential for chaff to have a long-term adverse impact on water quality is very unlikely, and chemicals leached from the chaff will also be diluted by the surrounding seawater, thus reducing the potential for concentrations to build up to levels that can affect sediment quality and benthic habitats. Further analysis of chaff and its environmental effects is provided in Section 3.2, Expended Materials.

Even though chaff dipoles contain aluminum and other trace metals that can ultimately be leached from the chaff, the amount of chaff needed to raise environmental concentrations of these metals above background levels far exceeds the number than can be realistically deposited in a given area of land or body of water. Chaff is generally resistant to chemical weathering, and likely remains in the environment for long periods. Chaff is much like aluminosilicate minerals, so its influence on the physical environment will be small, and likely limited to settling with bottom geology. Ocean waters are in constant contact with crustal materials, so there is little reason to believe that small amounts of chaff would affect either water or sediment composition (Hullar et al. 1999).

Naval Gun Shells

Under the No Action Alternative, 10,564 gun shells will be expended each year. Assuming a distribution of expended materials over 20 percent of the TMAA, the deposition rate of expended naval gun shells will be approximately 1.26 items per nm^2 (0.36 items per km^2) per year. Navy training in the TMAA will deposit an estimated 1,320 lb (600 kg) of hazardous material from shells (heavy metals) in the TMAA.

Expended training materials from naval gun shells are relatively inert. Expended materials may contain heavy metals, but effects on water and sediment quality will be limited to a small area around the expended round. Expended materials will settle to the sea bottom, where they will become encrusted by chemical processes and marine organisms. Metals will leach slowly, and will not pose a hazard to ocean water resources because leached constituents will be rapidly dispersed by ocean currents.

Small Arms Rounds

Five thousand small arms rounds will be expended per year under the No Action Alternative, which will result in approximately 180 lb of expended material. Assuming a distribution of expended materials over 20 percent of the TMAA, small arms expended materials will result in a deposition rate of 0.6 item per nm^2 (0.17 item per km^2) per year. The weight of expended small arms rounds will be minimal (180 lb [81kg]), with about 2 lb (less than one kg) of hazardous material (heavy metals) from Navy training exercises in the TMAA. This deposition will have minimal impacts on ocean water resources because its density is low and the materials are relatively inert.

Sonobuoys

The No Action Alternative will use SSQ-36 Bathythermograph (BT) sonobuoys, which monitor water temperature. Sonobuoys consist of two main sections: a surface unit that contains the seawater battery and a metal subsurface unit. Sonobuoy components of concern for water resources are the seawater batteries, lithium batteries, battery electrodes, metal housing, lead solder, copper wire, and lead used for ballast. Sonobuoys also expend inert materials, such as parachutes and nylon wire.

Batteries

Each sonobuoy contains a seawater battery, housed in the upper, floating portion, which supplies power to the sonobuoy. These seawater batteries contain about 300 grams of lead, in addition to battery electrodes composed of lead chloride, cuprous thiocyanide, or silver chloride. In cases where the upper portion of the sonobuoy is lost to the seabed, the lead batteries are also lost. Silver chloride, lithium, or lithium iron disulfide thermal batteries are used to power subsurface units. The lithium-sulfur batteries used typically contain lithium sulfur dioxide and lithium bromide, but may also contain lithium carbon monofluoroxide, lithium manganese dioxide, sulfur dioxide, and acenitrile (a cyanide compound). During battery operation, the lithium reacts with the sulfur dioxide to form lithium dithionite. Lithium iron disulfide thermal batteries are used in Directional Command Activated Sonobuoy System (DICASS) sonobuoys. An important component of the thermal battery is a hermetically sealed casing of welded stainless steel 0.03- to 0.1-in thick that is resistant to the battery electrolytes (Klassen 2005).

The evaluation of the potential effects associated with seawater batteries includes comparing the expected concentrations of potentially toxic battery constituents with USEPA water quality criteria established for the protection of aquatic life or with conservative toxicity thresholds available from the literature. Chemical reactions of sonobuoy batteries proceed almost to completion once the cell is activated, and only a small amount of reactants remain when the battery life ends. These residual materials will slowly dissolve and become diluted by ongoing ocean and tidal currents. Given the mobility of the most soluble battery constituent, lead chloride, there is a low potential for substantial accumulations of contaminants in sediments. As the outside metal case corrodes, it becomes encrusted by seawater processes and marine organisms, thus slowing the rate of further corrosion. Many of the components of concern are coated with plastic to reduce corrosion, providing an effective barrier to water exchange. In instances where seawater causes the body of the sonobuoy to corrode, that corrosion will take at least 40 years (Klassen 2005).

Lithium always occurs as a stable mineral or salt, such as lithium chloride or lithium bromide (Ksozos 2003). Lithium is naturally present in freshwater, soil, and sediment. A study demonstrated that sodium ions in saltwater mitigate the toxicity of lithium to sensitive aquatic species. (Fathead minnows

[*Pimephales promelas*] and water fleas [*Ceriodaphnia dubia*] were unaffected by lithium concentrations as high as 6 milligrams per liter [mg/L] in the presence of tolerated concentrations of sodium). In the marine environment, therefore, where sodium concentrations are at least an order of magnitude higher than tolerance limits for the tested freshwater species, lithium would be essentially nontoxic. Because of these factors, lithium batteries would not adversely affect marine water quality. One estimate concluded that 99 percent of the lithium in a battery would be released to the environment over 55 years. The release will result in a dissolved lithium concentration of 83 mg/L in the immediate area of the breach in the sonobuoy housing. At a distance of 5.5 mm from the breach, the concentration of lithium will be about 15 mg/L, or 10 percent of typical seawater lithium values (150 ppm); thus it would be difficult to distinguish the additional concentration due to the lithium leakage from the background concentration (Klassen 2005).

Two studies involved on-site or laboratory studies of batteries expended from U.S. Coast Guard aid-to-navigation sites (USEPA 2001, Borener and Maughan 1998). Sediment samples were taken adjacent to and near the navigation sites, and were analyzed for all metal constituents in the batteries. Results indicated that metals were either below or consistent with background levels or compared favorably with NOAA sediment screening levels, "reportable quantities" under the Comprehensive Environmental Response, Compensation, and Liability Act §103(a), or USEPA toxicity procedures.

A study by the Navy (DoN 1993) examined the impact of materials released by activated seawater batteries in sonobuoys that freely dissolve in the water column (e.g., lead, silver, and copper ions), as well as nickel-plated steel housing, lead solder, copper wire, and lead shot used for sonobuoy ballast. The study concluded that constituents released by saltwater batteries, as well as the decomposition of other sonobuoy components, did not exceed state or federal standards, and that the reaction products are short-lived in seawater. A detailed description of this study is provided in Section 3.2, Expended Materials.

The impacts of lead and lithium (among other materials) were studied at the CFMETR near Nanoose Bay, British Columbia, Canada (CFMETR 2005). These materials are common to EMATTs, Acoustic Device Countermeasures, sonobuoys, and torpedoes. The CFMETR study noted that lead is a naturally occurring heavy metal in the environment. Cores taken of marine sediments in the test range show a steady increase in lead concentration from the bottom of the core to a depth of approximately 8 in (20 cm). Sediments found at this depth were deposited during the late 1970s and early 1980s, and their elevated lead concentrations were attributed to deposition of atmospheric lead derived from a gasoline additive. The sediment cores showed a general reduction in lead concentration with decreasing depth, coincident with the phasing out of lead-based additives in gasoline by the mid-1980s. The study also noted that studies at other ranges have shown minimal impacts of lead ballasts because they are usually buried deep in marine sediments where they are not biologically available. The study concluded that there would be no effects from the lead ballasts due to the low probability of mobilization (CFMETR 2005).

Regarding lithium, cores of marine sediments taken in the test range showed fairly consistent lithium concentrations with depth, indicating little change in lithium deposition with time. Compared with ambient lithium concentrations from outside the range, the report concluded that "it is difficult to demonstrate an environmental impact of lithium caused by CFMETR" (CFMETR 2005).

Lead in Sonobuoys

Sonobuoys contain other metal and nonmetal components, such as metal housing (nickel-plated, steel-coated with polyvinyl chloride plastics to reduce corrosion), batteries, lead solder, copper wire, and lead used for ballast that, over time, can release hazardous constituents into the surrounding water. Most of the other sonobuoy components are either coated with plastic to reduce corrosion or are solid metal. The slow rate at which solid metal components are corroded by seawater translates into slow release rates into the marine environment. Once the metal surfaces corrode, the rate of metal released into the environment decreases. Releases of chemical constituents from all metal and nonmetal sonobuoy components are further reduced by natural encrustation of exposed surfaces. Therefore, corrosive components of the

sonobuoy do not substantially degrade marine water quality. Sonobuoy hazardous components are analyzed in Section 3.2, Expended Materials.

Under the No Action Alternative, 24 SSQ-36 BT sonobuoys will be expended each year. These expended materials will weigh approximately 936 lb (421 kg), and will be deposited on the ocean floor at a rate of 0.11 lb per nm^2 (0.01 kg per km^2) per year. Approximately 71 lb (32 kg) per year of hazardous materials will be deposited by sonobuoy use in the TMAA. This rate of hazardous materials deposition is not expected to affect water resources. The effects of sonobuoy batteries will be as described in this section. Expended sonobuoys may contaminate nearby water and sediment, but ocean and tidal currents will disperse these chemicals quickly. Thus, with the low concentration of expended training materials in the study area, sonobuoy use under the No Action Alternative in GOA will not have substantial effects on water resources.

Summary – No Action Alternative Effects

Table 3.3-3 provides a summary of expended materials that will be deposited on the floor of the ocean in the TMAA. Under the No Action Alternative, 15,982 items will be expended each year during training exercises. Assuming a distribution of expended materials over 20 percent of the TMAA, the deposition rate of expended materials will be 1.92 items per nm^2 (0.55 items per km^2) per year. The weight of all expended materials will be approximately 76,200 lb (34,600 kg) tons per year, at a density of 9.0 lb per nm^2 (1.2 kg per km^2) of ocean per year. Assuming Navy training under the No Action Alternative would remain consistent over periods of five and 20 years, the Navy will expend approximately 191 tons (45.2 lb per nm^2 [5.9 kg per km^2]) and 762 tons (181 lb per nm^2 [23.8 kg per km^2]) of training materials in the TMAA, respectively. Of the expended materials, only a small amount would be considered hazardous (approximately 2.45 percent or 1,870 lb [850 kg]). Given that many of these materials are relatively inert, this level of deposition will have minimal impacts on ocean water resources.

3.3.2.5 Alternative 1

Under Alternative 1, there would be an increase in training tempo in the TMAA, which would increase the amount of expended training materials. Alternative 1 would introduce ASW training exercises that would use additional sonobuoys and underwater targets. This section analyzes the possible impacts of water quality from training in the TMAA under Alternative 1. Table 3.3-7 summarizes the expended materials for Navy training under Alternative 1. Table 3.3-8 shows the weight of hazardous materials in each type of training material and the percentage of hazardous materials in the total expended materials weight.

Table 3.3-7: Training Materials Expended Annually – Alternative 1

Type of Training Material	Alternative 1		No Action Alternative		Increase under Alternative 1 (%)	
	Number	Weight (lb)	Number	Weight (lb)	Number	Weight
Bombs	180	79,900	120	54,000	50	48
Missiles	33	10,200	22	6,770	50	50
Targets & pyrotechnics	322	5,610	252	3,610	28	55
Naval gun shells	13,188	13,800	10,564	10,700	25	28
Small arms rounds	5,700	210	5,000	180	14	17
Sonobuoys	793	30,900	24	936	3,200	3,200
PUTR	7	2,100	NA	NA	NA	NA
Total	**20,223**	**143,000**	**15,982**	**76,200**	**26**	**87**

Note: Weights of expended materials are estimates, and are rounded to three significant digits; PUTR: Portable Undersea Training Range

Table 3.3-8: Expended Materials Considered Hazardous – Alternative 1

Type of Training Material	Weight of Material (lb)[1]		Hazardous Content (%)
	Expended Material	Hazardous Material	
Bombs	79,900	617	0.77
Missiles	10,200	84.5	0.83
Targets and pyrotechnics	5,610	190	3.39
Naval gun shells	13,800	1,650	12.0
Small-caliber rounds	210	2.10	1.00
Sonobuoys	30,900	2,340	7.57
PUTR	2,100	0	0
Total	**143,000**	**4,890**	**3.42**

Note: Weights of expended materials are estimates, and are rounded to three significant digits
(1) Weights of hazardous materials are based upon available information, and may not include hazardous weight of all expended materials.

Materials Expended During Training – Alternative 1

Bombs

Under Alternative 1, 180 bombs would be expended each year in the TMAA (a 50-percent increase over the No Action Alternative). Alternative 1 would increase the amount of bombs by 60, of which 36 would be inert. Inert bombs may contain spotting charges, but the small amount of explosives would have negligible impacts on the environment. Navy training in the TMAA would result in approximately 79,900 lb (36,000 kg) of expended bomb material each year Assuming expended materials from bombs would be deposited on 20 percent of the TMAA, their deposition rate would be approximately 9.51 lb per nm^2 (2.76 lb per km^2) of ocean per year. The amount of hazardous material (unconsumed explosives) would increase from 390 lb per year under the No Action Alternative to 617 lb per year under Alternative 1. This rate of deposition would increase the concentration of hazardous materials on portions of the ocean bottom in the TMAA by approximately 0.07 lb per nm^2 (0.01 kg per km^2). Expended materials would settle to the sea bottom. Materials would corrode and become encrusted through chemical processes and marine organisms. Chemical leaching rates would decrease and, therefore, pose no hazard to ocean water resources. The additional use of bombs under Alternative 1 would have no measurable adverse impacts because the density of expended bombs on the ocean floor would be low and relatively inert materials would be the majority of the expended material weight.

Missiles

Under Alternative 1, 33 missiles would be expended per year, an increase of 11 over the No Action Alternative. The weight of expended materials would be 10,200 lb (4,590 kg), with a deposition rate of approximately 1.21 lb per nm^2 (0.16 kg per km^2) of ocean per year. Hazardous materials would also increase by 50 percent, with 85 lb (38 kg) (57 lb [26 kg] of explosive and 28 lb [13 kg] of propellant) of hazardous materials being deposited per year in the TMAA. As noted under the No Action Alternative, no expended missiles would be recovered. The primary constituents of concern in missiles (i.e., solid propellant) would be expended in the marine environment if the missile failed to function properly. Solid propellants decompose very slowly in the marine environment. Ocean and tidal currents would disperse these materials to undetectable concentrations under Alternative 1. Thus, there would be no substantial impact on water resources.

Targets and Pyrotechnics

Table 3.3-9 compares the types and numbers of targets and pyrotechnics under Alternative 1 to those under the No Action Alternative.

Table 3.3-9: Targets and Pyrotechnics Expended Annually – Alternative 1

Type of Target or Pyrotechnic	Number of Items		Increase under Alternative 1	
	Alternative 1	No Action Alternative	Numerical	Percent
Targets				
TDU-34 towed target	3	2	1	50
TALD*	12	8	4	50
BQM-74E unmanned aircraft	2	2	0	0
Killer Tomato surface target	12	10	2	20
SPAR	12	10	2	20
MK-39 EMATT*	20	0	20	0
Pyrotechnics				
LUU-2B/B*	18	12	6	50
MK-58 Marine Marker*	60	20	40	200
Chaff*	212	212	0	0
Total number used	**351**	**276**	**75**	**27**
Total not recovered	**322**	**252**	**70**	**28**
Total Expended Weight (lb)	**5,610**	**3,610**	**2,000**	**55**

Note: * not recovered

Under Alternative 1, the number of targets and pyrotechnics used in the TMAA would increase by 27 percent (75 items). Targets and pyrotechnics not recovered represent 92 percent of all training materials. The weight of expended targets would increase by 55 percent, but the density of expended materials on the ocean floor would be low because of the large area of the TMAA. A new type of target (MK-39 EMATT) would be used during ASW exercises. The use of EMATTs for ASW exercises would expend 120 lb (56 kg) per year of lithium batteries. Approximately 22 percent of unrecovered items are flares (MK-58 and LUU-2B/B), the bulk of which are consumed as heat and smoke. Annual residual pyrotechnic materials from flares would weigh approximately 66 lb (30 kg). No additional chaff would be used under Alternative 1, and chaff effects would be similar to effects under the No Action Alternative. Given the small amount of hazardous materials and the inert nature of most components, these training materials would not have a measurable impact on ocean water resources.

Naval Gun Shells

Alternative 1 proposes a 25-percent increase in the number of naval gun shells (13,188 gun shells or 13,800 lb [6,270 kg]) over the No Action Alternative. Assuming that expended materials would be deposited on 20 percent of the TMAA, the deposition rate of expended materials would be approximately 1.57 gun shells or 1.64 lb per nm^2 (0.45 gun shell or 0.22 kg per km^2) of ocean per year. Approximately 1,650 lb (750 kg) per year of these materials would be hazardous. Naval gun shells are generally inert in the marine environment. Expended shells may contain heavy metals, such as lead, but these metals would be a small percentage of the shell. The shells would settle to the ocean bottom and corrode, becoming encrusted by chemical processes and marine organisms. Any effects would be limited to the immediate area around the expended shell; ocean currents would disperse leached substances quickly. Therefore, expended materials from naval gun shells under Alternative 1 would not affect ocean water resources.

Small Arms Rounds

Under Alternative 1, 5,700 small-caliber rounds would be expended each year in the TMAA, a 14-percent increase over the No Action Alternative. Assuming that expended training materials would be deposited on 20 percent of the TMAA, expended small arms would have a deposition rate of approximately 0.7 item per nm^2 (0.20 item per km^2) of ocean per year. Expended training materials would result in 210 lb (95 kg)

per year of material being deposited on the ocean floor, of which approximately 2.1 lb (0.9 kg) per year would be considered hazardous. Given the inert nature of the majority of these items, this rate of deposition would not have a substantial impact on ocean water resources.

Sonobuoys

Alternative 1 would introduce ASW as a new training mission area to the TMAA. ASW would use sonobuoys to assist aircraft and surface vessels in locating submarines. Table 3.3-10 shows the types and numbers of sonobuoys proposed under Alternative 1.

Table 3.3-10: Sonobuoys Expended Annually – Alternative 1

Type of Sonobuoy	Number of Items		Increase under Alternative 1 (%)
	Alternative 1	No Action Alternative	
SSQ-36 BT (passive)	60	24	150
SSQ-53 DIFAR (passive)	500	0	NA
SSQ-62 DICASS (active)	133	0	NA
SSQ-77 VLAD (passive)	60	0	NA
SSQ-110A IEER (explosive) or SSQ-125 AEER (Tonal)	40	0	NA
Total Number	**793**	**24**	**3,200**
Total Weight (lb)	**30,900**	**936**	**3,200**

Notes: Numbers and weights of training items are estimates, and are rounded to three significant digits; NA = Not applicable; DIFAR: Directional Frequency Analysis and Recording; VLAD: Vertical Line Array Directional Frequency Analysis and Recording; IEER: Improved Extended Echo Ranging Sonobuoy; AEER: Advanced Extended Echo Ranging Sonobuoy.

Under Alternative 1, 793 sonobuoys would be expended each year. Assuming that expended sonobuoys would be deposited on 20 percent of the TMAA, the deposition rate would be approximately 0.1 expended sonobuoy per nm^2 (0.03 sonobuoy per km^2) of ocean per year. Expended sonobuoys would weigh 30,900 lb (13,900 kg) per year, with a deposition rate (by weight) of approximately 3.7 lb per nm^2 (0.47 kg per km^2) of ocean per year. Hazardous materials of expended sonobuoys would weigh approximately 2,340 lb (1,050 kg), increasing the concentration of these materials on the ocean floor in the TMAA by approximately 0.28 lb per nm^2 (0.04 kg per km^2) each year. The expended sonobuoys would be relatively inert in the marine environment, becoming encrusted by corrosion and benthic organisms; these natural processes would decrease leaching rates, and ocean and tidal currents would disperse hazardous constituents as they leached. Hazardous materials would be dispersed over large areas of ocean bottom. Therefore, expended sonobuoys would have a negligible impact on ocean water resources under Alternative 1.

Explosive Sonobuoys – Potential Impacts of Detonation Byproducts

One type of sonobuoy, the SSQ-110A IEER sonobuoy used in ASW training under Alternatives 1 and 2, would contain two 4.2-lb explosive charges (Global Security 2008b). The explosives contain 90 percent RDX and small amounts of PBX and hexanistrostilbene, a detonator component. The most toxic byproducts are the hydrogen fluoride compounds (H_xF_x), but only a small percentage (0.63 percent) of the H_xF_x byproduct is expected to dissolve in the water prior to reaching the surface. Ocean and tidal currents would rapidly disperse byproducts. Further discussion of the materials produced by sonobuoy detonations is provided in Section 3.2, Expended Materials.

Given this dilution and the large area within which the sonobuoys would be deployed, the adverse impacts of detonation byproducts would be negligible. Leaching chemicals, such as lead and lithium,

would result in water and sediment toxicity surrounding each expended sonobuoy. The effect would be limited to the immediate area of the leaching source because mixing and dispersion by ocean currents would quickly dilute chemicals to concentrations below harmful levels. SSQ-110A sonobuoys would make up 5.5 percent of the expended sonobuoys during training exercises. With a deposition rate of 0.1 expended sonobuoy per year per nm^2 of ocean, any impact on water resources would be negligible.

Portable Undersea Training Range

The PUTR would require the installation of seven anchors. Upon completion of training, these anchors would remain on the ocean floor. Each anchor would weigh approximately 300 lb, which would result in approximately 2,100 lb of expended materials. Anchors would be made of concrete or sand bags, which would be covered by sand or sediment over time. No hazardous materials would be associated with these anchors and, thus, effects on the marine environment would be minimal.

Summary – Alternative 1 Impacts

A summary of expended materials under Alternative 1 is provided in Table 3.3-7. Under Alternative 1, 20,223 items would be expended each year, a 26-percent increase over the No Action Alternative. Assuming a distribution of these materials over 20 percent of the TMAA, the deposition rate of expended items would be 2.40 items per nm^2 (0.69 items per km^2) of ocean per year. Alternative 1 would increase the expended materials weight by 87 percent over the No Action Alternative. Deposition of expended materials in the TMAA would be approximately 143,000 lb (65,000 kg) or approximately 16.9 lb per nm^2 (2.23 kg per km^2) of ocean per year. Assuming Navy training under Alternative 1 would remain consistent over periods of 5 and 20 years, the Navy would expend approximately 358 tons (84.8 lb per nm^2 [11.2 kg per km^2]) and 1,430 tons (339 lb per nm^2 [44.7 kg per km^2]) in the TMAA, respectively. Many of these items are relatively inert, and would settle to the sea floor.

Alternative 1 would result in an increase in expended hazardous materials of about 160 percent (4,890 lb [2,220 kg]), but would only deposit approximately 0.58 lb of hazardous materials per nm^2 (0.08 kg per km^2) of ocean per year within 20 percent of the TMAA. The metals would corrode, eventually becoming encrusted through chemical processes and marine organisms, and would pose no hazard to ocean water resources. Leaching would decrease as surfaces become encrusted through natural processes. Hazardous materials from explosive constituents would be mostly consumed upon detonation, and would not affect water quality. The remaining hazardous materials have low solubility in water, and would leach hazardous materials at rates below harmful concentrations.

3.3.2.6 Alternative 2

Under Alternative 2, Carrier Strike Group exercises would take place two times per year, compared to once per year under the No Action Alternative and Alternative 1. This increase in training tempo would increase the amount of expended training materials. Under Alternative 2, SINKEX would occur in the TMAA. During SINKEX, a decommissioned surface ship is towed to a deep-water location and sunk using a variety of ordnance. A summary of training materials expended annually under Alternative 2 is provided in Table 3.3-11. Table 3.3-12 shows the weights of hazardous materials for each type of training material and the percentage of hazardous materials in the total expended materials weight.

Materials Expended during Training in the TMAA – Alternative 2

Bombs

Under Alternative 2, 360 bombs would be expended each year in the TMAA (a 200-percent increase over the No Action Alternative). One hundred forty-four of the additional 240 bombs (60 percent) expended under Alternative 2 would be inert. With expended materials deposited on 20 percent of the TMAA, the

deposition rate of expended materials would be approximately 0.04 item or 19.0 lb per nm^2 (0.01 item or 2.5 kg per km^2) of ocean per year.

Table 3.3-11: Training Materials Expended Annually – Alternative 2

Type of Training Material	Alternative 2		No Action Alternative		Increase under Alternative 2 (%)	
	Number	Weight (lb)	Number	Weight (lb)	Number	Weight
Bombs	360	160,000	120	54,000	200	200
Missiles	66	20,300	22	6,770	200	200
Targets & pyrotechnics	644	11,200	252	3,610	160	210
Naval gun shells	26,376	27,500	10,564	10,700	150	160
Small-caliber rounds	11,400	420	5,000	180	130	130
Sonobuoys	1,587	61,900	24	936	6,500	6,500
PUTR	7	2,100	NA	NA	NA	NA
SINKEX[1]	858	70,000	NA	NA	NA	NA
Total	**41,298**	**352,000**	**15,982**	**76,200**	**160**	**360**

Notes: Weights of expended materials are estimates, and are rounded to three significant digits, NA = Not applicable; (1) Due to the variability in weight of available ship hulks, the expended weight for SINKEX does not include the ship hulk weight.

Table 3.3-12: Percent of Expended Material Considered Hazardous – Alternative 2

Type of Training Material	Weight of Materials (lb)[1]		Hazardous Content (%)
	Expended Material	Hazardous Material	
Bombs	160,000	1,130	0.70
Missiles	20,300	169	0.83
Targets and pyrotechnics	11,200	381	3.40
Naval gun shells	27,500	3,310	1.31
Small-caliber rounds	420	4.20	1.00
Sonobuoys	61,900	4,680	7.56
PUTR	2,100	0	0
SINKEX	70,000	850	1.25
Total	**352,000**	**10,500**	**2.98**

Notes: Weights of expended materials are estimates, and are rounded to three significant digits; (1) Weights of hazardous materials are based upon available information, and may not include the hazardous weight of all expended materials; NA = Not applicable

Bombs used under Alternative 2 would deposit approximately 160,000 lb (72,000 kg) of expended material, and 1,130 lb (510 kg) per year of hazardous materials. Alternative 2 would deposit approximately 0.13 lb of hazardous materials per nm^2 (0.02 kg per km^2) of ocean per year in the TMAA. Inert bombs would contain spotting charges; the small amount of explosives would not have a substantial effect on water quality. Expended materials would settle to the sea bottom and corrode. This would cause the metals to become encrusted by chemical processes and marine organisms and, therefore, pose no hazard to ocean water resources. The use of live bombs would have no measurable adverse impacts on water quality because these items would be dispersed over large areas of ocean and because their hazardous constituents would be mostly consumed upon detonation.

Missiles

Under Alternative 2, 66 missiles would be used each year, an increase of 44 over the No Action Alternative. Expended material weight from missiles would increase 200 percent over the No Action

Alternative to 20,300 lb (9,140 kg) tons per year. Distributed over 20 percent of the TMAA, missile use during training would deposit 2.4 lb (1.1. kg) of expended training material per nm^2 (0.3 kg per km^2) of ocean per year. As noted under the No Action Alternative, missiles used during training would not be recovered. The constituent of concern in missiles (i.e., solid propellant) becomes hazardous to water resources only if missiles fail to function properly, and such materials decompose very slowly in the marine environment. Ocean and tidal currents would disperse these materials to undetectable levels; thus, there would be no substantial impact on water resources under Alternative 2.

Targets and Pyrotechnics

Table 3.3-13 compares the types and numbers of targets and pyrotechnics for the study area under Alternative 2 compared to the No Action Alternative.

Table 3.3-13: Targets and Pyrotechnics Expended Annually – Alternative 2

Type of Target or Pyrotechnic	Number of Items		Increase under Alternative 2	
	Alternative 2	No Action Alternative	Numerical	Percent
Targets				
TDU-34 towed target	6	2	4	200
TALD*	24	8	16	200
BQM-74E unmanned aircraft	4	2	2	100
Killer Tomato surface target	24	10	14	140
SPAR	24	10	14	140
MK-39 EMATT*	40	0	40	0
Pyrotechnics				
LUU-2B/B*	36	12	24	200
MK-58 Marine Marker*	120	20	100	500
Chaff*	424	212	212	100
Total number used	**702**	**276**	**426**	**150**
Total not recovered	**644**	**252**	**392**	**160**
Total Expended Weight (lb)	**11,200**	**3,610**	**7,610**	**210**

Notes: * Not recovered; Percentages are estimates, and are rounded to three significant digits.

Under Alternative 2, the number of targets and pyrotechnics used would increase by 150 percent (426 items) over the No Action Alternative. Items not recovered would represent about 92 percent of all training materials (644 items per year), and 90 percent of these items would be pyrotechnics. Expended targets would deposit 11,200 lb (5,040 kg) per year of expended material on the sea floor, an increase of 210 percent over the No Action Alternative. Most of the expended materials would be relatively inert in the marine environment, with 381 lb (170 kg) per year of expended materials (approximately 130 lb [59 kg] of residual pyrotechnic materials and 250 lb [113 kg] of batteries from EMATTs) considered to be hazardous. This rate of hazardous materials deposition would have minimal effects on the marine environment because of its low density (0.05 lb per nm^2 [less than 0.01 kg per km^2]) in the TMAA.

Chaff use would increase to 1,080 lb (490 kg) per year under Alternative 2, but would not affect water resources because of the large dispersal area and its inert composition. Expended chaff would have similar effects to those described under the No Action Alternative. Given the number of items and the relatively inert nature of the components, these training materials would not have a measurable impact on ocean water resources.

Naval Gun Shells

Alternative 2 proposes a 150-percent increase in naval gun shells over the No Action Alternative. A total of 26,376 gun shells would be expended annually under Alternative 2, resulting in approximately 27,500 lb (12,500 kg) of expended material. Assuming expended materials would be deposited over 20 percent of the TMAA, approximately 3.26 lb of expended material per nm^2 (0.43 kg per km^2) of ocean would be deposited annually in the TMAA. Approximately 3,310 lb (1,500 kg) per year of this material would be hazardous. This amount of material would have negligible effects on the marine environment because effects would be limited to the immediate area around expended shells. Hazardous materials would not cause harmful concentrations of heavy metals in the surrounding water column because of their low concentration (0.39 lb per nm^2 [less than 0.05 kg per km^2]) and rapid dispersal of leached hazardous substances by ocean currents. The expended shells would settle to the sea bottom, and would degrade as described under the No Action Alternative. Under Alternative 2, the naval gun shells would have no substantial impact because they consist of relatively inert materials that degrade slowly in the environment.

Small Arms Rounds

Under Alternative 2, 11,400 small arms rounds would be used each year, an increase of 130 percent over the No Action Alternative. Alternative 2 would deposit less than 1.4 expended rounds per nm^2 (0.39 items per km^2) of ocean per year, assuming deposition on 20 percent of the TMAA. The total expended weight of small arms rounds would be 420 lb (190 kg) per year, and approximately 4.2 lb (1.9 kg) per year of hazardous materials. Given the inert nature of the majority of these items, this level of deposition would have a negligible impact on ocean water resources.

Sonobuoys

Table 3.3-14 compares the types and numbers of sonobuoys proposed under Alternative 2 compared to the No Action Alternative.

Table 3.3-14: Sonobuoys Expended Annually – Alternative 2

Type of Sonobuoy	Number of Items		Increase under Alternative 2 (%)
	Alternative 2	No Action Alternative	
SSQ-36 BT	120	24	400
SSQ-53 DIFAR (passive)	1,000	0	NA
SSQ-62 DICASS (active)	267	0	NA
SSQ-77 VLAD (passive)	120	0	NA
SSQ-110A IEER (explosive) or SSQ-125 AEER (Tonal)	80	0	NA
Total Number	**1,587**	**24**	**6,500**
Total Weight (lb)	**61,900**	**936**	**6,500**

Note: Numbers of expended materials are estimates; NA = Not applicable

Under Alternative 2, 1,587 sonobuoys would be used each year during training exercises. Assuming an expended materials deposition area of 20 percent of the TMAA, the deposition rate of expended sonobuoys would be approximately 0.2 sonobuoy per nm^2 (0.05 sonobuoys per km^2) of ocean per year. Expended materials from sonobuoys would weigh approximately 61,900 lb (27,900 kg) per year, with a deposition rate (by weight) of 7.35 lb per nm^2 (0.96 kg per km^2) of ocean per year.

About 4,680 lb (2,100 kg) of hazardous materials would be deposited annually on the ocean floor from ASW exercises using sonobuoys, which would deposit approximately 0.56 lb per year of hazardous material per nm^2 (0.07 kg per km^2) of ocean. Section 3.3.4.1 discusses the potential impact on water resources of sonobuoy batteries and explosive components. Given the conclusions in that section, sonobuoy use under Alternative 2 would only affect water and sediment quality in the immediate vicinity of expended sonobuoys. Ocean currents would quickly disperse leached substances to concentrations below harmful levels. Thus, the proposed increase in sonobuoy use under Alternative 2 would have no measurable impact on water resources.

Portable Undersea Training Range

Under Alternative 2, PUTR would require the same number of anchors (seven) to be placed on the ocean floor as under Alternative 1. Anchors would be made of concrete or sand, and would not contain any hazardous materials. Any effects on the marine environment would be the same as under Alternative 1.

SINKEX

Alternative 2 would include two SINKEX events (one each summertime training exercise). Table 3.3-15 provides a list of the types and numbers of training materials that could be expended annually during SINKEX.

Table 3.3-15: Training Materials Expended During a SINKEX

Type of Training Material	Number of Items
Missiles	
AGM-65 Maverick	6
AGM-84 Harpoon	10
AGM-88 high-speed anti-radiation missile (HARM)	4
AGM-114 Hellfire	2
AGM-119 Penguin	2
Standard Missile-1	2
Standard Missile-2	2
Bombs	
MK-82 (inert)	6
MK-82 (live)	14
MK-83	8
Naval Gun Shells	
5-in gun shells	800
Torpedoes	
MK-48 ADCAP torpedo	2
Targets	
Surface Ship Hulk	2
Total	**858**
Total Expended Weight (lb)	**70,000[1]**
Total Hazardous Weight (lb)	**850**

Notes: Numbers are cumulative for two separate SINKEX events; (1) Due to the variability in weight of available ship hulks, the total expended weight does not include ship hulk weights.

Ordnance use during SINKEX would vary, based on training requirements and training conditions. For example, a MK-48 ADCAP torpedo would only be used at the conclusion of SINKEX if the target vessel was still afloat. This analysis assumes that the greatest number of ordnance would be used during SINKEX under Alternative 2. Therefore, 858 ordnance items per year would be expended during two

SINKEX events under Alternative 2. This would result in approximately 70,000 lb (31,500 kg) per year of expended materials, which would increase the ocean floor density of such materials by approximately 8.3 lb per nm^2 (1.0 kg per km^2) per year. Most of these materials would be relatively inert, with approximately 850 lb (380 kg) per year of hazardous material (e.g., residual explosives, propellant, and heavy metals such as lead). These materials would be in solid forms, and would leach slowly because of their low solubility. In the past, vessels used for SINKEX had most of the solid PCBs removed, leaving estimates of up to 100 lb of PCBs on board with sinking took place (USEPA 1999). This amount of hazardous materials would not have an effect on the marine environment.

Alternative 2 would expend two surface vessels per year during two SINKEX events. For SINKEX, the vessels used as targets are selected from a list of U.S. Navy-approved vessels that have been cleaned in accordance with USEPA guidelines. By rule, SINKEX would be conducted at least 50 nm (93 km) offshore and in water at least 6,000 feet deep (1,830 m) (40 CFR §229.2). USEPA considers the contaminant levels that would be released during the sinking of a target vessel to be within the standards of the Marine Protection, Research, and Sanctuaries Act (16 USC 1341, et seq.). As with other inert materials, the vessel would become encrusted by chemical processes and biological organisms. Therefore, vessels used as targets would not pose a hazard to ocean water resources.

Summary of Impacts – Alternative 2 (Preferred Alternative)

Training materials expended under Alternative 2 are summarized in Table 3.3-11. Under Alternative 2, 41,298 items would be expended each year, a 160-percent increase over the No Action Alternative. This would result in approximately 4.90 items per nm^2 (1.42 items per km^2). The weight of expended materials would increase 360 percent to 352,000 lb (160,000 kg) per year. Assuming expended materials would be deposited on 20 percent of the TMAA, the deposition rate of expended materials would be approximately 41 lb per nm^2 (5.4 kg per km^2) of ocean per year. Assuming Navy training under Alternative 2 would remain consistent over periods of five and 20 years, the Navy would expend approximately 880 tons (209 lb per nm^2 [27.5 kg per km^2]) and 3,520 tons (835 lb per nm^2 [110 kg per km^2]) of training materials in the TMAA, respectively.

Under Alternative 2, approximately 10,500 lb (4,770 kg) per year of hazardous material would be expended. Assuming deposition of expended materials on 20 percent of the TMAA, the ocean floor density of annually expended hazardous materials would be approximately 1.2 lb per nm^2 (0.2 kg per km^2). Alternative 2 would also include two decommissioned surface vessels expended during two SINKEX events. Vessels would be cleaned according to USEPA standards, and would be considered relatively inert in the marine environment. Solid PCBs would be removed to the maximum extent practicable, but some vessel materials with PCBs would remain on board when the vessel in sunk (approximately 100 lb per vessel [USEPA 1999]).

Most expended materials would be relatively inert, and hazardous materials would either be consumed upon detonation or would be present in insoluble forms. Most expended materials would be relatively inert and would settle to the sea bottom, becoming encrusted by chemical processes and marine organisms. This would slow chemical leaching below harmful concentrations, and pose no hazard to ocean water resources. Expended materials under Alternative 2 would not substantially impact water resources because the distribution density of hazardous materials would be low and most expended training materials would consist of relatively inert substances that degrade slowly in the marine environment.

3.3.3 Mitigation

Impacts on water resources under the alternatives would be below thresholds that could result in long-term degradation of water resources or affect water quality. Possible impacts on water quality during

normal operating conditions would continue to be mitigated by measures identified in Section 3.3.1.2. No additional mitigation measures would be implemented because there would be no substantial impact on water quality.

3.3.4 Summary of Effects

None of the proposed alternatives would have long-term or substantial impacts on water resources in the TMAA. Short-term effects on water resources would be related to ordnance use and expended materials, and would not be anticipated to be measurable, given the large area over which activities occur and the dynamic nature of the marine environment. Table 3.3-16 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on water resources under both NEPA and EO 12114.

Table 3.3-16: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1997, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on water resources would occur. • Aircraft overflights would not involve expenditures of training materials, and thus would not affect water quality.	• With a distribution of expended materials over 20 percent of the TMAA, the deposition rate of expended materials will be 1.92 items per nm^2 (0.55 items per km^2) per year. • Ordnance constituents and other materials (batteries, fuel, and propellant) from training devices have minimal effect or are below standards. • No long-term degradation of marine water quality.
Alternative 1	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1997, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on water resources would occur. • Aircraft overflights would not involve expenditures of training materials, and thus would not affect water quality.	• An estimated 26-percent increase in expended training materials would occur, compared to the No Action Alternative. With a distribution of these materials over 20 percent of the TMAA, the deposition rate of expended items would be 2.40 items per nm^2 (0.69 items per km^2) per year. • Deposition of hazardous materials (i.e., batteries, fuel, and propellant) from expended materials would be minimal (less than ½ lb per nm^2). • No long-term degradation of marine water quality would occur.
Alternative 2 (Preferred Alternative)	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1997, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on water resources would occur. • Aircraft overflights would not involve	• An estimated 160 percent increase in expended training materials would occur, compared to the No Action Alternative. With a distribution of these materials over 20 percent of the TMAA, the deposition rate of expended items would be approximately 4.90 items per nm^2 (1.42 items per km^2) per year. • Impacts from the increase in expended

	expenditures of training materials, and thus would not affect water quality.	materials would be minimal because most expended materials (97 percent) would be inert in the marine environment. • Assuming deposition over 20% of the TMAA, the amount of hazardous materials from expended materials would be low, approximately 1.2 lb per nm^2 per year.

3.4 Acoustic Environment (Airborne)

3.4 ACOUSTIC ENVIRONMENT (AIRBORNE)

3.4.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the region of influence (ROI) for the acoustic environment includes the Temporary Maritime Activities Area (TMAA). Activities involving use of airspace inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

Aircraft overflights occurring above 15,000 feet (ft) in altitude will take place in airspace over the U.S. territorial seas (0-12 nautical miles [nm]) to the TMAA. Given the altitude of these subsonic flights, they will have no effect on the acoustic environment and are, therefore, dismissed from further analysis.

3.4.1.1 Introduction to Sound

Sound is a physical phenomenon and a form of energy that can be described, measured, and represented with mathematical expressions. Noise, on the other hand, is not a physical process, but rather an implicit social value, defined generally as unwanted sound. Recognition of sound is based on the receptor's objective and reproducible response to sound's primary physical attributes: intensity (perceived by the receptor as loudness), frequency (perceived as pitch), frequency distribution and variation over time, and duration (whether continuous, sporadic, or impulse). Perception of sound, however, is subjective and circumstantial. Sounds that are soothing to some are annoying to others, and sounds barely noticed and generally ignored in one circumstance may be considered highly objectionable in another circumstance.

Beyond subjective effects, however, sound at higher intensities or power levels can have physical consequences. The range of such impacts have been defined for humans as falling into three categories as sound pressure levels increase: subjective effects (e.g., annoyance, nuisance, dissatisfaction), interferences with activities (e.g. communication, sleep, learning, behavioral changes), and physiological effects (e.g., anxiety, hearing impacts, loss of hearing).

3.4.1.2 Sound Characteristics

Sound Fundamentals

Sound is typically described by its magnitude (otherwise referred to as amplitude), intensity, and frequency and the changes in those values over time (e.g., sudden impulse vs. continuous vs. repetitive). The physical phenomenon of sound is generated by mechanical vibrations traveling through an elastic medium (i.e., air or water), resulting in a rapid change in pressure (high and low pressure fluctuations or waves) in the medium.

Sound waves are characterized by parameters such as amplitude, intensity, wavelength, frequency, and velocity. The amount of energy contained in a sound pressure wave is referred to as its amplitude, while the amount of energy passing through a unit area per unit of time is the sound wave's intensity. The units of sound intensity are watts per square meter (energy per unit of time per unit of area). Amplitude and intensity are directly and linearly related. Higher amplitude sounds are perceived to be louder than lower amplitude sounds. Sound pressures are usually represented in micropascals (μPa). A pascal is equal to one newton of force distributed over 1 square meter. The maximum sound pressure level of a noise event is referred to as the "peak noise level."

The frequency of sound represents the rate at which the source produces sound waves (a complete cycle of high and low pressure waves) or the rate at which the sound-producing body completes one vibration

cycle. Frequency is a precisely measurable quantity representative of a particular sound. Sounds are produced throughout a wide range of frequencies, including frequencies beyond the audible range of a given receptor. Most of the sounds we hear in the environment do not consist of a single frequency, but rather a broad band of frequencies differing in sound level. The intensities of each frequency add to generate the sound we hear.

The speed of sound is not affected by its intensity, amplitude, or frequency, but rather depends wholly on the characteristics of the medium through which it is passing. Sound generally travels faster as the density of the medium increases. Speeds of sound through air are primarily influenced by air temperature, and negligibly by the air's relative humidity and pressure, averaging about 1,115 feet/second (ft/sec) (340 meters/second [m/sec]) at standard barometric pressure. Sound speeds in air increase as air temperature increases. Speed of sounds in liquid is similarly influenced primarily by the liquid's density and temperature. Thus, the speed of sound in 32 degrees Fahrenheit (°F) (0 degrees Celsius [°C]) water is 4,600 ft/sec (1,402 m/sec) and in 68°F (20°C) water is 4,862 ft/sec (1,482 m/sec). The speed of sounds in solids is a more complex matter, with longitudinal and transverse waves traveling at different speeds depending on the density of the material as well as its geometry and molecular structure.

The mathematical relationship between sound stimulus and sound perception by a human receptor is logarithmic. This logarithmic relationship between magnitude and perception is the basis for the decibel (dB) scale used to express sound intensity. The decibel scale measures relative sound intensities rather than absolute intensities; specifically, it measures the ratio of a given intensity (of sound) to the threshold sound intensity of human hearing (by definition 0 dB). For most human individuals, a sound wave pressure of 20 μPa represents the hearing threshold. As sound stimuli increases geometrically (i.e., multiplied by a fixed factor), the corresponding perception changes arithmetically (i.e., additive by constant amounts). Thus, a tenfold increase in sound stimulus over the threshold of hearing is assigned a value of 10 dB but is perceived as a doubling of loudness; a hundredfold increase to 20 dB is perceived as sound that is four times louder, and so forth (Figure 3.4-1).

Although sound is a physical phenomenon that can be represented by mathematical expressions and measured with precision, perception of sound pressure level is the result of physiological responses as well as subjective factors, each influenced by current circumstances and past exposures. The sound pressure level is the perception of a sound wave's pressure by a single receptor at a specified distance and direction from the sound source.

Sound pressure levels are measured by sound level meters, which typically contain filters that reduce the meter's sensitivity to frequencies of little or no relevance to the human receptor. The method commonly used to quantify environmental sounds consists of determining all of the frequencies according to a weighting system that reflects the nonlinear response characteristics of the human ear. Filtering the very low and very high frequency sounds thus acts as a general approximation of the human ear's response to sounds of medium intensity. This is called "A" weighting, and the decibel level measured is called the A-weighted sound level (dBA). In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA curve.

A common method of describing sound pressure levels is by comparing commonly experienced sounds. Typical sound sources and their corresponding environments are presented in Figure 3.4-1. Sound levels indicated are for single events. Such events are discrete, and two or more events cannot simply be added together. Integrating varying noise levels and sources over a given period requires complex calculations or modeling.

The sound measure employed by federal agencies is known as the day-night average sound level (DNL). The DNL is defined as the A-weighted average sound level for a 24-hour day. It is a calculated noise

metric derived from measurements but includes a 10-dB penalty for late-night (i.e., 10:00 p.m. to 7:00 a.m.) sound levels. This penalty accounts for the increased sensitivity of humans to noise at night.

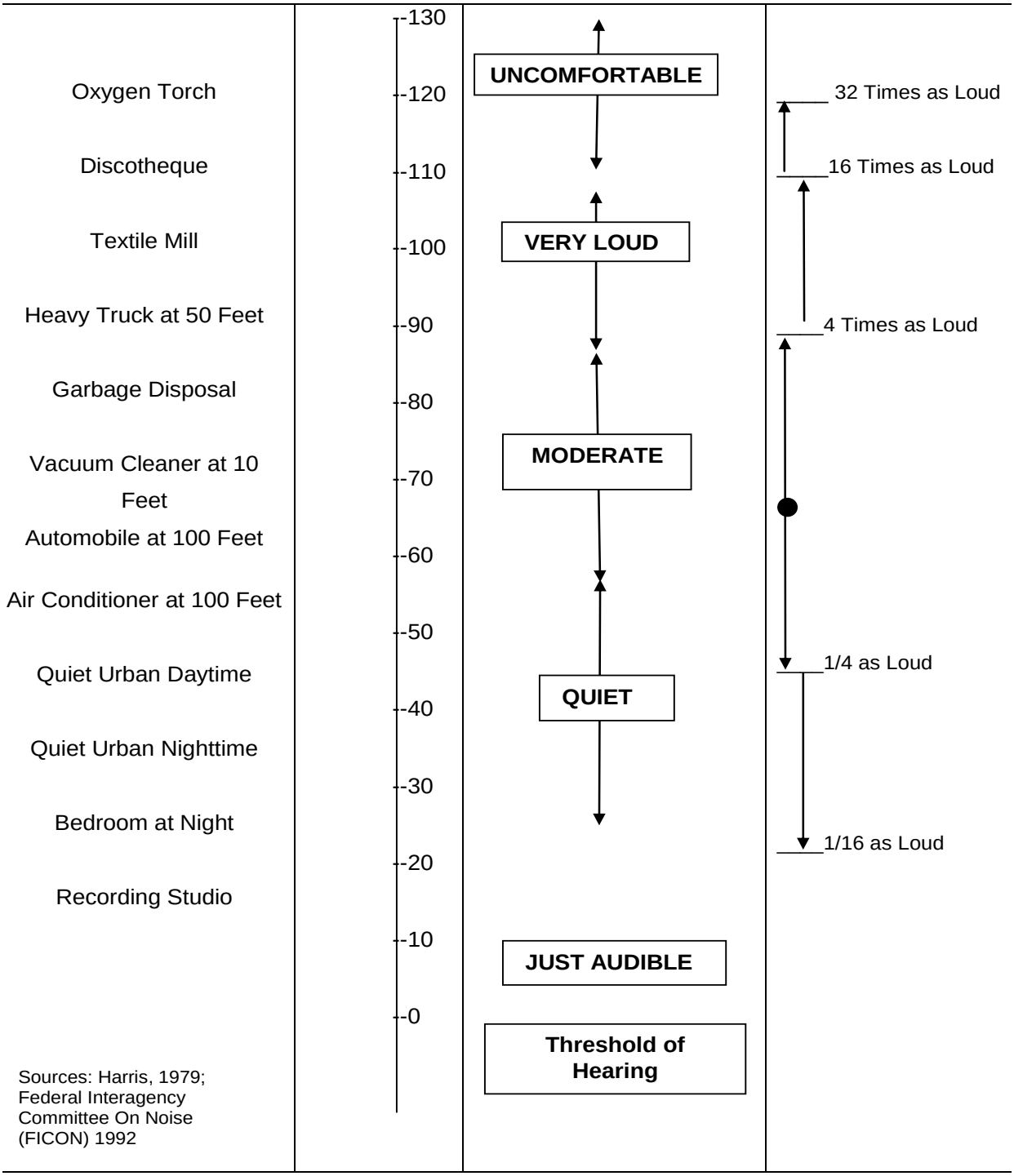


Figure 3.4-1: Sound Levels of Typical Airborne Noise Sources and Environments

Sound Propagation

Understanding the impact of sound on a receptor requires a basic understanding of how sound propagates from its source. Sound propagation follows the inverse square law: the intensity of a sound wave decreases inversely with the square of the distance between the source and the receptor. Thus, doubling the distance between the receptor and a sound source results in a reduction in the intensity of the sound of one fourth of its initial value; tripling the distance results in one ninth of the original intensity, and so on.

Sound propagates through gases and liquids primarily as longitudinal waves, causing displacements of the molecules comprising the gas or liquid in directions generally parallel to the direction of the sound wave. While the concept of a longitudinal or transverse sound wave traveling from its source to a receptor is relatively simple, sound propagation in fact is quite complex due to the simultaneous presence of numerous sound waves of different frequencies and other phenomena such as reflections of sound waves and subsequent constructive or destructive interferences between reflected and incident waves.

Interferences between two waves with different frequencies result in the production of "beats." Depending on whether the interferences between these waves are constructive (where their amplitudes are additive) or destructive (where their amplitudes cancel each other), the sound perceived by the receptor is alternately loud and soft, with the rate at which such amplitude changes occur generally reflecting the difference between the frequencies of the two interacting waves. Perception of interfering sound waves is complex, and in some frequency ranges the receptor perceives ("hears") neither of the frequencies of the interacting waves, but rather a third frequency known as a "subjective tone" or "difference tone."

3.4.2 Existing Conditions

3.4.2.1 Ambient Sound

Airborne noise sources at sea include those from manmade sources such as sounds produced from commercial, fishing, research, and recreational vessels, and general and commercial aviation. Navy training events may also add to these sounds intermittently and at widely separate locations in the TMAA during an exercise period (an exercise lasting a maximum of 21 days in the April to October timeframe occurring once or twice a year depending on the alternative).

Issues with regard to airborne noise as transmitted underwater are discussed in Sections 3.5 (Marine Plants and Invertebrates), 3.6 (Fish), 3.7 (Sea Turtles), 3.8 (Marine Mammals), and 3.9 (Birds).

3.4.2.2 Sound from Military Sources

Airborne noise attributable to military activities in the TMAA emanates from multiple sources including naval ship power plants, military aircraft, target engine noise, bombs, missiles, and gunfire. The boundaries of the TMAA form a roughly rectangular area oriented from northwest to southeast, approximately 300 nautical miles (nm) (556 kilometers [km]) long by 150 nm (278 km) wide, situated south of Prince William Sound and east of Kodiak Island. The TMAA is an area 42,146 square nautical miles (nm^2) (144,556 square kilometers [km^2]) in size. With the exception of Cape Cleare on Montague Island located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259.3 km) offshore. Therefore, sound in the TMAA from military sources will originate no closer than approximately 12 nm (22 km) from the nearest shoreline, and these will be sounds generally dominated by high aircraft overflight noise.

Military Aircraft

Flying aircraft contribute sound to the environment. As with most manmade sounds, most aircraft sounds involve low frequencies. Aircraft sound entering the water at an angle of incidence of 13 degrees from the

vertical or less will lose some of the sound energy as sound is transmitted under the water's surface. At greater angles of incidence, the water surface acts as an effective reflector of the sound wave, allowing the sound energy to remain largely unchanged in the above-water environment (Urick 1972, Eller and Cavanagh 2000). Navy training activities involving aircraft in the TMAA are generally dispersed over large expanses of the open ocean. Representative sound levels associated with military aircraft and ordnance use are depicted in Table 3.4-1.

Table 3.4-1: Representative Aircraft and Ordnance Sound Sources in the TMAA

Noise Source	Sound Level (dBA)
Jet Aircraft Takeoff	115 @ 1,000 ft
SH-60 Helicopter Hovering	90 @ 50 ft
ASW Target Drop	90 @ 50 ft
Chaff (packet rupture at high altitude) Aircraft ALE-37	90 @ 50 ft
Aircraft Defensive Flares	65 @ 50 ft
Practice Bombs, 25 lb inert, spotting charge	60 @ 50 ft
Inert Bombs, 500 lb (at impact)	105 @ 50 ft
Inert Bombs, 1,000 lb (at impact)	108 @ 50 ft
Live Bombs, 500 lb (at impact)	110 @ 50 ft
Live Bombs, 1,000 lb (at impact)	125 @ 50 ft
Naval Gun Ammunition 5"/54	110 @ 50 ft
Cannon Shells, 20mm (at source)	105 @ 50 ft
Cannon Shells, 25mm (at source)	110 @ 50 ft
7.62mm M60 Machine Gun	90 @ 50 ft
0.50-caliber Machine Gun	98 @ 50 ft

Notes: 50 ft and 1,000 ft are standard reference distances. ASW - Anti-Submarine Warfare; dBA - decibels, A-weighted; ft - feet; lb - pound; TMAA – Temporary Maritime Activities Area; mm - millimeters
Source: Investigative Science and Engineering (ISE), 1997; Naval Air Station Whidbey Island, 1993; Ewbank, 1977

Sonic Boom Noise

Supersonic aircraft flights can occur from time to time in the TMAA. Such flights are usually limited to altitudes above 30,000 ft (9,144 m) and/or locations more than 30 nm (55.6 km) from shore. Several factors influence sonic booms: weight, size, shape of aircraft or vehicle; altitude; flight paths; and atmospheric conditions. A larger and heavier aircraft must displace more air and create more lift to sustain flight compared with small, light aircraft. Therefore, larger aircraft create sonic booms that are stronger and louder than those of smaller, lighter aircraft. Consequently, the larger and heavier the aircraft, the stronger the sonic boom shock waves will be (Department of Navy [DoN] 2007).

Of all the factors influencing sonic booms, increasing altitude is the most effective method of reducing sonic boom intensity. The width of the boom "carpet" or area exposed to sonic boom beneath an aircraft is about 1 mile (mi) (1.6 km) for each 1,000 ft (305 m) of altitude. For example, an aircraft flying supersonic straight and level at 50,000 ft (15,240 km) can produce a sonic boom carpet about 50 mi (80 km) wide. The sonic boom, however, will not be uniform. Maximum intensity is directly beneath the aircraft, and decreases as the lateral distance from the flight path increases until shock waves refract away from the ground and the sonic boom attenuates. The lateral spreading of the sonic boom depends only on altitude, speed, and the atmosphere, and is independent of the vehicle's shape, size, and weight. The ratio

of the aircraft length to maximum cross-sectional area also influences the intensity of the sonic boom. The longer and more slender the aircraft, the weaker the shock waves will be. The wider and more blunt the vehicle, the stronger the shock wave can be (DoN 2007). Sonic booms are generated as aircraft reach Mach 1.0 (speed of sound) and increase in intensity as the Mach number increases.

Ordnance Use

Impulsive sound results from ordnance use in the TMAA. Some representative ordnance sound levels are depicted in Table 3.4-1.

Missile and Target Launch

Sound associated with missile and target launches occurs in the TMAA infrequently, and then only during scheduled events. Due to safety concerns over launch activities, a buffer zone of several square miles is always instituted and enforced. Sound due to missile and target launches is typically at a maximum at the point of initiation of the booster rocket, and rapidly fades as (1) the missile or target reaches optimal thrust conditions, and (2) the missile or target reaches a downrange distance where the booster burns out and a sustainer engine continues. For example, data for the BQM-34 show that its booster Jet Assisted Take-Off (JATO) bottles generate 113 dBA at the source at launch. Sound levels decrease to 99 dBA at 2,400 ft (731.5 m) (DoN 1998). The BQM-34 may be used in the TMAA (though much less frequently than the smaller BQM-74).

In the TMAA, the BQM-74 is likely to be the typical target drone. It can be launched from surface vessels as shown in Figure 3.4-2, as well as aircraft. The BQM-74s will be used during Surface-to-Air (S-A) Missile Exercise (MISSILEX) training proposed to occur under Alternatives 1 and 2. They are proposed to occur very infrequently. The events take place at high altitude (between 10,000 ft and 20,000 ft [3,048 m and 6,096 m) and over 12 nm (22.2 km) from shore.



Figure 3.4-2: Target Drone Launch

Nonexplosive Impact Noise

Nonexplosive impact sound in the TMAA is generally from high-velocity "dummy" projectiles and inert training bombs. Sounds of this type are produced by the kinetic energy transfer of the object with the target or earth's surface, and are highly localized to the area of disturbance. Sound associated with the

impact event is typically of low frequency (less than 250 Hertz [Hz]) and of a short enough duration (i.e., impulse sound) that it produces negligible amounts of acoustic energy. These events occur far out to sea in connection with events such as an Air-to-Surface (A-S) Bombing Exercise (BOMBEX) that are restricted from the public, so they often go unobserved. The impacts may be scored by remote observers—participants in the exercise who are at a safe distance from the source.

Ordnance Detonations

Ordnance detonated at the water surface can introduce loud, impulsive, broadband sounds into the marine environment. The potential impacts of explosive detonations on wildlife are considered in Sections 3.5 (Marine Plants and Invertebrates), 3.6 (Fish), 3.7 (Sea Turtles), 3.8 (Marine Mammals), and 3.9 (Birds). The airborne noise associated with underwater explosions is minimal. A characteristic phenomenon of the difference in acoustic impedance between air and water is that the air/water interface will act as a very good reflector, the so-called Lloyd mirror. Therefore, very little energy will pass this reflector, meaning that sound generated in the water will not pass over to the air and vice versa.

Three source parameters influence the effect of an explosive: the weight of the explosive warhead, the type of explosive material, and the detonation depth. The net explosive weight (NEW) accounts for the first two parameters. The NEW of an explosive is the weight of the explosive material in a given round, referenced to the explosive power of trinitrotoluene (TNT) or C4. Table 3.4-2 sets forth the explosive weight of various explosive ordnance items used in the TMAA. The ordnance used is shown with the particular training event using that ordnance. All events will occur in the open ocean far from shore.

Table 3.4-2: Training Events Utilizing Explosives in the TMAA

Training Event	Ordnance Involved (Net Explosive Weight per Item)
Air-to-Air MISSILEX	AIM 7 Sparrow (85 lb), AIM 9 Sidewinder (20.8 lb), AIM-120 AMRAAM (48 lb)
Surface-to-Air MISSILEX	Standard missile (223 lb)
Air-to-Surface BOMBEX, SINKEX	MK-82 (192.2 lb), MK-83 (415.8 lb) and MK-84 (944.7 lb)
Gunnery Exercise (GUNEX, SINKEX)	5-inch naval gunfire (8.8 lb), 76mm gun rounds (1.3 lb)
ASW Tracking Exercise (TRACKEX)-Maritime Patrol Aircraft (MPA)	IEER sonobuoys (two 4 lb charges per sonobuoy)
SINKEX (Surface to Surface, Air to Surface, Torpedo)	HARM (41.6 lb), Harpoon (265 lb), Maverick (78.5 lb), Hellfire (16.4 lb), Penguin (123 lb), Standard Missile 1 (223 lb), MK-48 (851 lb)

The detonation depth of an explosive in the water is important due to a propagation effect known as surface-image interference. For sources located near the sea surface, a distinct interference pattern arises from the coherent sum of the two paths that differ only by a single reflection from the pressure-release surface. As the source depth and/or the source frequency decreases, the destructive interference of these two paths increases and reaches total cancellation at the surface (barring surface reflection scattering loss). Since all explosive sources used in military activities in the TMAA (with two exceptions) are munitions that detonate essentially on impact, the effective source depths are quite shallow, and therefore the surface-image interference effect can be pronounced. The exceptions are the SSQ-110 (Improved Extended Echo Ranging [IEER]) sonobuoy, which is a small underwater detonation producing no airborne noise and the MK-48 torpedo (associated with SINKEX).

3.4.2.3 Current Requirements and Practices

In accordance with aircraft standard operating procedures, each aircrew will be familiar with the noise profiles of their aircraft and shall be committed to minimizing noise impacts without compromising operational and safety requirements. Flights of naval aircraft shall be conducted so that a minimum of annoyance is experienced by persons that may be below. It is not enough for the pilot to be satisfied that no person is actually endangered. Definite and particular effort shall be taken to fly in such a manner that individuals do not believe they or their property are endangered.

3.4.3 Environmental Consequences

As noted in Section 3.4.1, the ROI for the acoustic environment includes the TMAA. Navy training activities that occur within the Air Force inland Special Use Airspace (SUA) and the Army inland training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, and Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) in the TMAA are analyzed in this EIS/OEIS pursuant to Executive Order (EO) 12114.

3.4.3.1 Previous Analyses

Impacts related to the acoustic environment were previously evaluated in Sections 3.3, 4.3, and Appendix F of the *Alaska Military Operations Areas EIS* (USAF 1995); Sections 3.2.5 and 4.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007); Sections 3.22 and 4.22 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999); and Sections 3.16 and 4.16 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.4.3.2 Approach to Analysis

A description of noise-related environmental stressors, data sources, and methodology related to assessing airborne-noise related environmental consequences follows.

Noise-Related Environmental Stressors

Navy GOA training activities will involve fixed-wing aircraft, helicopters, ships, missiles, gunfire, and explosive ordnance that are all potential sources of airborne noise. Airborne noises generated through implementation of the proposed action generally consist of either (1) noise that would be experienced over the course of an aircraft overflight or (2) impulse noise such as would be experienced during gunfire or ordnance detonation. The discussion of noise associated with Navy training events focuses on airborne sound above the water's surface and its potential impacts to human receptors. In the ocean area of the TMAA, the potential receptors could be merchant seamen, fishermen, and boaters (personnel participating in training are not considered to be sensitive receptors[1] of airborne noise for purposes of environmental impact analysis). Given the distance from shore for the majority of the TMAA, Notices to Mariners (NOTMARs), and the inability to safely conduct most training activities in the vicinity of non-training participants, these potential human receptors should not be present and therefore will not be exposed to high levels of sound resulting from training activities.

[1] For analysis of impacts on the acoustic environment, a "sensitive receptor" is a location of a human activity where the introduction of sound as noise would have an adverse impact on the activity associated with that location. Examples of typical types of locations (sensitive receptors) include residences, places of worship, schools, hospitals, some businesses (e.g., cinema, concert hall), or the outdoors (e.g., parks, natural areas). Examples of potential impacts to these locations can involve the effects to occupancy, re-sale, purpose, or enjoyment of the environment (natural quiet).

Noise impacts on humans depend on a variety of factors, including the duration of the noise event, the decibel level of the noise event, and the context of the noise within the ambient noise environment. Table 3.4-3 illustrates the various training events that occur associated with the proposed training activities, the noise stressors associated with each training event, and the general location where the events occur. As shown in the table, potential noise stressors can emanate from aircraft engine noise, surface vessel engine noise, and ordnance noise. Most training event types occur far out in the open ocean, given the approximate center of the TMAA is located 140 mi from the coast with the closest boundary 24 nm from shore and thus beyond the hearing of any human receptors on shore.

Table 3.4-3: Warfare Areas and Noise-Related Environmental Stressors

		Stressors			Location		
Primary Warfare Area and Activity	**Training Area(s)**	**Surface Vessel Engine Noise**	**Aircraft Engine Noise**	**Explosive or Gunfire Noise**	**Over land**	**0-12 nm from shore**	**Beyond 12 nm**
Anti-Air Warfare (AAW)							
Air Combat Maneuver (ACM)	TMAA, Air Force SUA		✓		✓	✓	✓
Air Defense Exercise (ADEX)	TMAA	✓	✓			✓	✓
Missile Exercise (Surface-to-Air) (MISSILEX [S-A])	TMAA	✓	✓	✓			✓
Gunnery Exercise (Surface-to-Air) (GUNEX [S-A])	TMAA	✓	✓	✓		✓	✓
Missile Exercise (Air-to-Air) (MISSILEX [A-A])	TMAA, Air Force SUA		✓	✓	✓	✓	✓
Surface Warfare (SUW)							
Visit Board Search and Seizure (VBSS)	ATA	✓	✓				✓
Missile Exercise (Air-to-Surface) (MISSILEX [A-S])	TMAA	✓	✓				✓
Bombing Exercise (Air-to-Surface) (BOMBEX [A-S])	TMAA		✓	✓			✓
Gunnery Exercise (Air-to-Surface) (GUNEX [A-S])	TMAA		✓	✓			✓
Gunnery Exercise (Surface-to-Surface) (GUNEX [S-S])	TMAA	✓		✓			✓
Maritime Interdiction	ATA	✓	✓			✓	✓
Sea Surface Control (SSC)	ATA	✓	✓				✓
Sinking Exercise (SINKEX)	TMAA	✓	✓	✓		✓	✓
Anti-Submarine Warfare (ASW)							
Anti-Submarine Warfare Tracking Exercise – Helicopter (ASW TRACKEX-Helo)	TMAA		✓				✓
Anti-Submarine Warfare Tracking Exercise – Maritime Patrol Aircraft (ASW TRACKEX-MPA)	TMAA		✓			✓	✓
Anti-Submarine Warfare Tracking Exercise – Extended/ Improved/ Advanced Echo Ranging (EER / IEER / AEER)	TMAA		✓				✓

Table 3.4-3: Warfare Areas and Noise-Related Environmental Stressors (continued)

		Stressors			Location		
Primary Warfare Area and Activity	**Training Area(s)**	**Surface Vessel Engine Noise**	**Aircraft Engine Noise**	**Explosive or Gunfire Noise**	**Over land**	**0-12 nm from shore[1]**	**Beyond 12 nm**
Anti-Submarine Warfare (ASW) (continued)							
Anti-Submarine Warfare Tracking Exercise-Surface Ship (ASW TRACKEX-Surface)	TMAA	✓					✓
Anti-Submarine Warfare Tracking Exercise – Submarine (ASW TRACKEX-Sub)	TMAA		✓				✓
Electronic Combat (EC)							
Electronic Combat (EC) Exercises	TMAA, Air Force SUA	✓	✓			✓	✓
Chaff Exercise (CHAFFEX)	TMAA, Air Force SUA	✓	✓			✓	✓
Counter Targeting Exercise	TMAA	✓	✓				✓
Naval Special Warfare (NSW)							
Insertion/Extraction	ATA		✓		✓		
Strike Warfare (STW)							
Bombing Exercise (Air-to-Ground) (BOMBEX [A-G])	Air Force SUA, Army ranges		✓	✓	✓	✓	
Personnel Recovery (PR)	TMAA, Air Force SUA, Army ranges	✓	✓		✓		✓
Other Activities							
Deck Landing Qualifications (DLQs)	ATA		✓				✓

Note: ATA- Alaska Training Areas; TMAA – Temporary Maritime Activities Area; SUA – Special Use Airspace
1 - The only activities that occur within 0-12 nm are aircraft overflights above 15,000 feet.

Data Sources

A review of relevant literature and data has been conducted to complete this analysis for airborne noise in the TMAA. Of the available scientific literature (both published and unpublished), the following types of documents were utilized in the assessment: journals, books, periodicals, bulletins, Department of Defense (DoD) operations reports, theses, dissertations, and other technical reports published by government agencies, private businesses, or consulting firms.

Assessment Methods

The method used in this EIS/OEIS to assess the airborne noise environment impacts associated with existing and proposed Navy training and testing within the TMAA includes the following steps:

- Analyze existing federal noise management regulations applicable to the proposed action;

- Consider existing Navy policies affecting noise production levels (e.g., standard operating procedures [SOPs]);
- Analyze the natural ambient or background noise levels in the TMAA;
- Analyze the various types of noise sources associated with training and testing within the TMAA (e.g., continuous versus impulsive noises); and
- Determine the overall noise environment impacts associated with existing Navy training and testing within the TMAA given the regulatory/procedural framework.

The analysis presented in this section is limited to impacts of airborne sound on humans. Impacts of military-generated sound on natural resources are addressed in Sections 3.6 (Fish), 3.7 (Sea Turtles), 3.8 (Marine Mammals), and 3.9 (Birds).

3.4.3.3 No Action Alternative

Under the No Action Alternative, noise levels would remain at current levels. Navy training in the TMAA, especially live firing of weapons and aircraft activities, is a source of intrusive noise in the immediate vicinity, but the only receptors of that noise should be personnel engaged in the training. Area clearance procedures and the issuance of NOTMARs are undertaken to prevent exposure of non-military personnel in ocean areas (such as fishermen in the TMAA). Training activities, such as launch and recovery of aircraft from a CVN and firing of weapons, would not take place if civilian vessels are present in the vicinity.

Personnel engaged in the training events who might be exposed to noise from these activities are required to take precautions, such as the wearing of protective equipment, to reduce or eliminate potential harmful effects of such exposure (personnel engaged in the training are not considered sensitive receptors for purposes of impacts analysis). The center of the TMAA is located approximately 140 nm (259.3 km) from shore, and at its closest is over 12 nm (22.2 km) from shore. Activities in the TMAA are likely to be beyond the hearing of any human receptors other than personnel who are part of the training event.

Because sound-generating events in the TMAA are intermittent, occur in remote areas or off-limits areas, and do not expose the public to high noise levels, no sensitive receptors are likely to be exposed to sound from military activities under the No Action Alternative.

3.4.3.4 Alternative 1

Under Alternative 1, in addition to training activities currently conducted, the Navy would increase the number of training activities above baseline levels for some activities and would conduct training associated with the introduction of new weapon systems, vessels, and aircraft into the Fleet. This alternative would include conducting Anti-Submarine Warfare (ASW) activities and the use of active sonar sources during ASW activities. Some of those ASW activities introduce the use of additional helicopters in low-level flight over the water and the use of the P-3 for the detection and tracking of submarines.

The replacement of the EA-6B with the EA-18G would decrease the contribution to the noise environment from these activities over the foreseeable future. Slight decreases in noise levels from past Navy training activities throughout the TMAA airspace would be expected given the projected decreases in noise levels from the EA-18G aircraft. Also planned is the use (beginning in 2013) of the P-8A Poseidon (Multimission Maritime Aircraft [MMA]) as the Navy's replacement for the aging P-3 Orion turbo-prop aircraft. MPA is a term used to describe both the P-3 Orion aircraft and the P-8A Poseidon. The P-8A is a modified Boeing 737-800ERX that brings together a highly reliable airframe and high-bypass turbo fan jet engine. It will be equipped with modern ASW, Anti-Surface Warfare (ASUW), and

intelligence, surveillance, and reconnaissance (ISR) sensors. In short, the P-8A MMA is a long-range ASW, ASUW, ISR aircraft that is capable of broad-area, maritime, and littoral activities. Average sound levels for the P-3 and P-8A are similar (for example, the P-8A is approximately 1 dB louder than the P-3 during takeoff; DoN 2008) so the minimal difference resulting from the proposed replacement of this aircraft should not result in any noticeable changes in sound levels in the TMAA.

Under Alternative 1, the majority of activities involving or potentially involving explosive ordnance in the TMAA would increase above current levels, as discussed in Chapter 2. As noted previously, precautions are taken to eliminate exposure of non-military personnel to unwanted sound from military activities. As with the No Action Alternative, sound-generating events under Alternative 1 are intermittent during the exercise period and would occur in remote areas or off-limits areas. The center of the TMAA is located approximately 140 nm (259.3 km) from shore and at its closest is over 12 nm (22 km) from shore. Activities in the TMAA are likely to be beyond the hearing of any human receptors.

3.4.3.5 Alternative 2

Under Alternative 2, the majority of Navy training activities would increase approximately twofold, as discussed in Chapter 2. Activities that include or would include aircraft make up a large portion of Alternative 2 activities. Although a small proportion of flights would be at altitudes as low as 300 ft, the preponderance of these air activities would take place at high altitudes far out to sea and out of range of human receptors.

Under Alternative 2, activities involving or potentially involving explosive ordnance would double. The types of sound generated by military activities under Alternative 2 would be identical to those under the No Action Alternative and Alternative 1. As with the No Action Alternative and Alternative 1, sound generating events under Alternative 2 are intermittent and would occur in remote ocean areas or off-limits areas. The center of the TMAA is located approximately 140 nm (259.3 km) from shore, and at its closest is over 12 nm (22 km) from shore. Activities in the TMAA are likely to be beyond the hearing of any human receptors. Precautions are taken pursuant to safety exclusion zone SOPs would prevent noise generating activities from occurring in the proximity to non-exercise personnel in ocean areas (such as fishermen in the TMAA). Members of the public at-sea in the TMAA, therefore, would not likely be exposed to high noise levels (such as may be generated by aircraft engine noise or explosive-related events).

Because sound-generating events in the TMAA are intermittent, occur in remote areas or off-limits areas, and do not expose the public to high noise levels, no sensitive receptors are likely to be exposed to sound from military activities under Alternative 2.

3.4.4 Mitigation

In the TMAA, most Navy training takes place far out to sea, and airborne noise levels will primarily affect military personnel operating the equipment/weapon systems producing the noise. Personnel engaged in the exercise wear personal protective equipment and are not considered sensitive receptors for purposes of this EIS/OEIS analysis. No additional noise-specific mitigation measures are required.

3.4.5 Summary of Effects

Table 3.4-4 summarizes the effects for the No Action Alternative, Alternative 1, and Alternative 2 on airborne noise under both NEPA and EO 12114.

Table 3.4-4: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, >12 nm)
No Action Alternative	• Current Navy activities involving aircraft overflight were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. territorial seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.	*Surface Ship Noise* • No change from current conditions. No sensitive receptors present. *Aircraft Noise* • No change from current conditions. Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • No change from current conditions. Very short-term noise impacts. No sensitive receptors present at sea.
Alternative 1	• Current Navy activities involving aircraft overflight were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. territorial seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.	*Surface Ship Noise* • Minor localized engine noise. No sensitive receptors present. *Aircraft Noise* • Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • Very short-term noise impacts. No sensitive receptors present at sea.
Alternative 2 (Preferred Alternative)	• Current Navy activities involving aircraft overflight were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to airborne noise would occur. • Aircraft overflights (> 15,000 ft) over the U.S. territorial seas (0-12 nm) to the TMAA would have no effect on the acoustic environment.	*Surface Ship Noise* • Minor localized engine noise. No sensitive receptors present. *Aircraft Noise* • Short-term noise impacts, including sonic booms. No sensitive receptors present at sea. *Weapon and Target Noise* • Very short-term noise impacts. No sensitive receptors present at sea.

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3.5 Marine Plants and Invertebrates

3.5 MARINE PLANTS AND INVERTEBRATES

3.5.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for marine plants and invertebrates includes the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). The TMAA is more than 12 nautical miles (nm) (22 kilometers [km]) from land and is therefore outside of United States (U.S.) territorial seas.

3.5.1.1 Existing Conditions

The GOA forms a large, semicircular bight opening southward into the North Pacific Ocean (Royer and Muench 1977, Stabeno et al. 2004; Figure 3.5-1). The region is bounded by the mountainous coast of Alaska to the west, north, and east and encompasses watersheds of the Alaskan Peninsula from 176º west (W) to the Canadian mainland on Queen Charlotte Sound (127.5ºW) (Mundy and Olsson 2005). The GOA is characterized by a broad and deep continental shelf containing numerous troughs and ridges, and the region receives high amounts of freshwater input, experiences numerous storms, and undergoes intense variability in waters overlying the continental shelf (Whitney et al. 2005).

The GOA is one of the world's most productive ocean regions and the habitats associated with these cold and turbulent waters contain identifiable collections of macrohabitats that sustain resident and migratory species including seabirds, marine mammals, invertebrates, and fishes (e.g., salmon and groundfish; Mundy and Cooney 2005, Mundy and Spies 2005); these habitats support some of the largest fisheries in the United States. (Heifetz et al. 2003).

Important ecosystem functions provided by marine plants and invertebrates within the GOA include the following:

- Phytoplankton form the basis of the ocean food chain.
- Zooplankton serves as an important food source for other organisms, including fishes and whales.
- Benthic invertebrates, which range from microscopic crustaceans to clams and crabs, also provide valuable links in the food chain and perform ecosystem functions such as nutrient processing.
- For humans, marine plants and invertebrates contribute to economic, cultural, and recreational activities in the GOA.

The TMAA is more than 12 nm (22 km) from the closest point of land and includes primarily offshore habitats including continental shelf, slope, and abyssal plain regions, which are influenced by both the Alaska Coastal Current and the Alaska Gyre (Figure 3.5-1). The TMAA consists of open ocean, and the following discussion is divided into two distinct habitat types:

- Pelagic, or open ocean habitat, and
- Benthic, or bottom dwelling habitat.

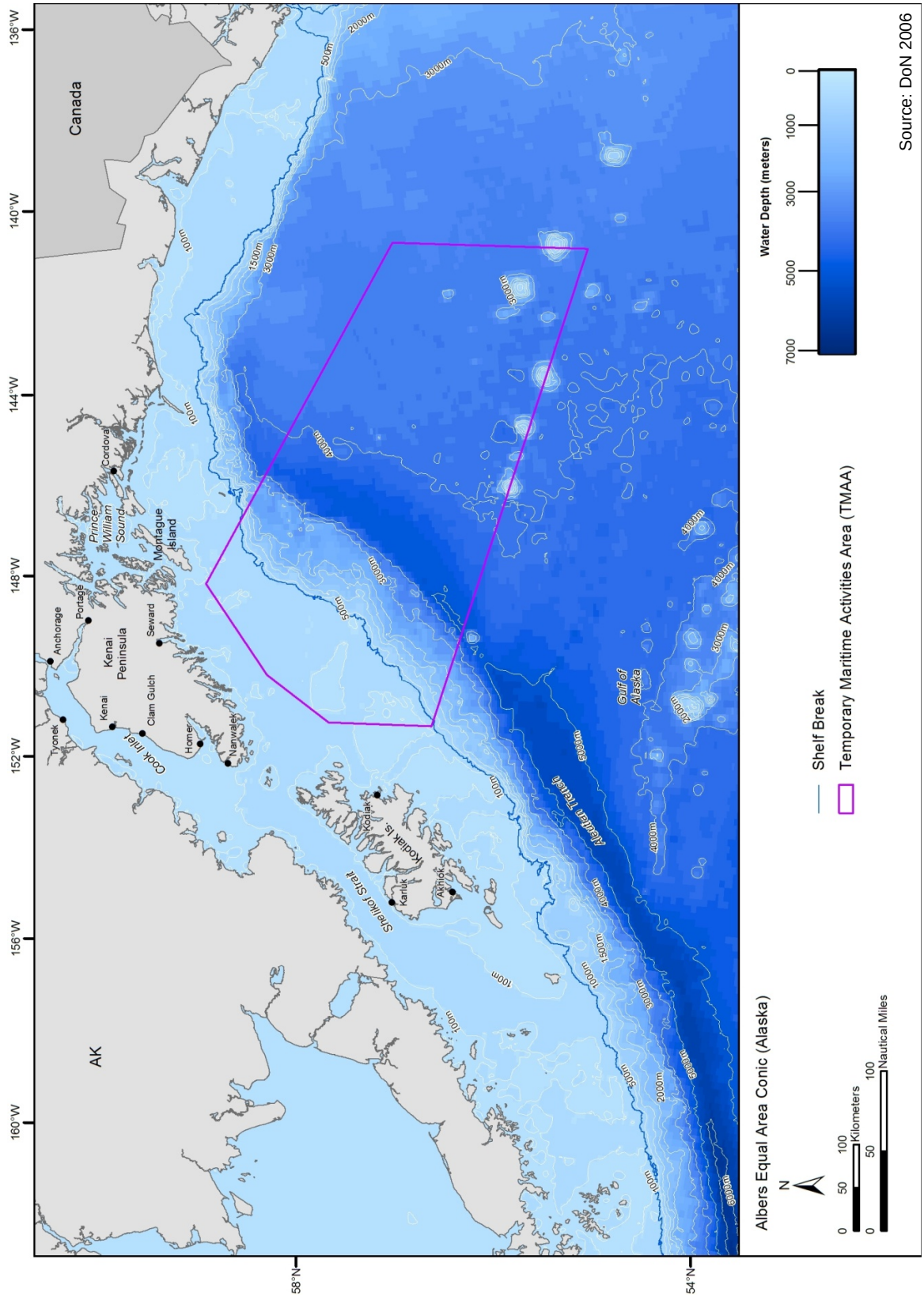


Figure 3.5-1: 2D Bathymetry of the TMAA and surrounding Vicinity

Open Ocean Pelagic Habitats

All areas except those near the coast and the sea floor are called the pelagic or oceanic zone; this zone is further divided into light and depth-dependent zones (Figure 3.5-2). The photic zone (with light) of the open ocean consists of the epipelagic and mesopelagic zones. The aphotic zone (without light) of the open ocean consists of all the zones lower in the ocean. The epipelagic zone stretches from the surface down to 660 feet (ft) (200 meters [m]) and is home to the greatest biodiversity in the sea, largely because of the availability of sunlight that enables photosynthetic organisms to thrive (Department of Navy [DoN] 2006). Both marine plants and animals are present in the epipelagic zone.

From 660 to 3,300 ft (200 to 1,000 m) is the mesopelagic zone, a twilight zone where some light filters through, but does not reach a level of brightness necessary for photosynthesis to occur.

The bathypelagic zone is from 3,300 to 13,200 ft (1,000 to 4,000 m) and completely dark. Plants are non-existent in the bathypelagic zone. Animals that can live here survive on the dead material, or detrius, that falls from surface zones or on other animals that live in the deep sea. Most animals in the abyssalpelagic zone, located from 13,200 ft (4,000 m) down, are blind and colorless due to the complete lack of light.

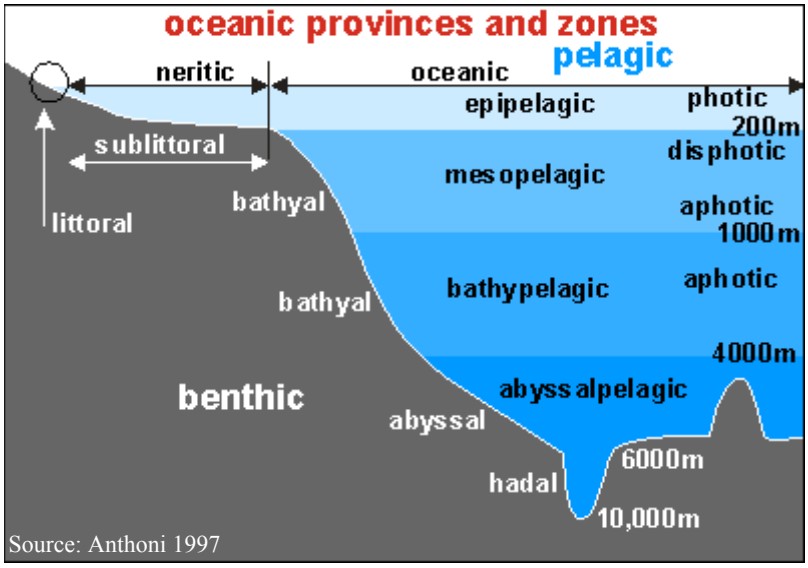


Figure 3.5-2: Oceanic Zones

Microscopic Communities

Plankton are organisms that float or drift in the water column and are unable to maintain their position against the movement of water masses (Parsons et al. 1984); they are at the mercy of the currents in the local aquatic environment. Planktonic assemblages include bacterioplankton (bacteria), zooplankton (animals) including ichthyoplankton (larval fish), and phytoplankton (plant-like). In general, plankton are very small or microscopic although there are exceptions. For example, jellyfish (even though some jellyfish can grow to 10 ft [3 m] in diameter) and pelagic *Sargassum* are considered part of the plankton group due to their inability to move against surrounding currents.

Phytoplankton

Phytoplankton make up most of the marine plant life in the GOA. These organisms photosynthesize to convert light energy into chemical energy; thereby, in the oceans, they comprise the lowest level of the food web and can be considered the most important group of organisms in the ocean. A vast majority of

organisms in the oceans depend either directly or indirectly on phytoplankton for survival. Growth and distribution of phytoplankton are influenced by several factors including temperature (Eppley 1972), light (Yentsch and Lee 1966), nutrient concentration (Goldman et al. 1979), alkalinity (pH), and salinity (Parsons et al. 1984). In general, the distribution of phytoplankton is patchy, occurring in regions with the optimal conditions for growth. The concentration of chlorophyll measured in the water column or at the sea surface can be used as a proxy for phytoplankton; regions of enhanced chlorophyll (chl a) concentrations are indicative of high phytoplankton abundance (Figure 3.5-3). In general, the concentration of phytoplankton decreases with increased distance from the shore and water depth.

Continental Shelf and Nearshore Waters

Although the predominance of downwelling conditions in the GOA limits the supply of nutrients to the shelf, it remains a highly productive region (Ladd et al. 2005b). Frequent storms, high tidal energy, persistent storms, and localized upwelling appear to be the primary mechanisms that enhance vertical mixing along the coastal shelf (Hood 1986, Sambrotto and Lorenzen 1986, Mundy and Spies 2005). Shelf and coastal waters host a traditional phytoplankton community composed of nanoplankton (2 to 20 microns [μm]) and microplankton (20 to 200 μm); large and small diatoms and dinoflagellates tend to dominate the region (Cooney 1986b, Sambrotto and Lorenzen 1986, Sherr et al. 2005). When production is high, diatoms commonly account for more than 80 percent of the phytoplankton (Whitney et al. 2005).

In the GOA, the annual production cycle is characterized by well-defined spring (and sometimes fall) blooms of large diatom species (most are larger than 50 μm; Cooney 2005). These blooms typically begin in late March and early April in response to a seasonal stabilization of the winter-conditioned deep mixed layer, and increased ambient light (Stabeno et al. 2004, Cooney 2005, Mundy and Cooney 2005).

These blooms and their associated high rates of photosynthesis typically last only 4 to 6 weeks before being controlled by nutrient depletion, sinking, and zooplankton grazing (Goering et al. 1973, Mundy and Cooney 2005). The timing, duration, and intensity of blooms are controlled largely by the physical structure of the water column. Depending on the variable conditions of any given spring, the plant bloom may be early or late by as much as 3 weeks; strong periods of wind, tidal mixing, or both during the bloom can prolong bloom events (Cooney 2005, Mundy and Cooney 2005, Weingartner 2005). When the phytoplankton bloom is prolonged in this way, its intensity is lessened.

In the late spring and early summer, large diatom-dominated spring blooms decline as nutrient supplies are diminished; dinoflagellates and other smaller forms are the dominant taxa under these conditions (Cooney 2005). In Prince William Sound, dominance in the phytoplankton bloom was shared by the large chain-forming diatoms including *Skeletonema*, *Thalassiosira*, and *Chaetoceros*. Later in June, when nutrients become more restrictive to growth, phytoplankton are dominated by smaller diatoms (e.g., *Rhizosolenia*) and tiny flagellates. Regions southeast of Kodiak Island have higher standing stocks during the summer than shelf regions to the northeast where fewer submarine canyons and troughs are located. It is believed that intrusion of nutrient-rich waters in these troughs and the subsequent mixing of these nutrients into the euphotic zone support this phytoplankton assemblage (Ladd et al. 2005a).

In some years, a nearshore or inshore fall bloom of diatoms occurs in September and October in response to a deepening wind-mixed layer and enhanced nutrient levels (Cooney 2005). A fall phytoplankton bloom occasionally can be detected in Prince William Sound. The ecological importance of this late-season production and the physical forces responsible are not yet understood (Mundy and Cooney 2005).

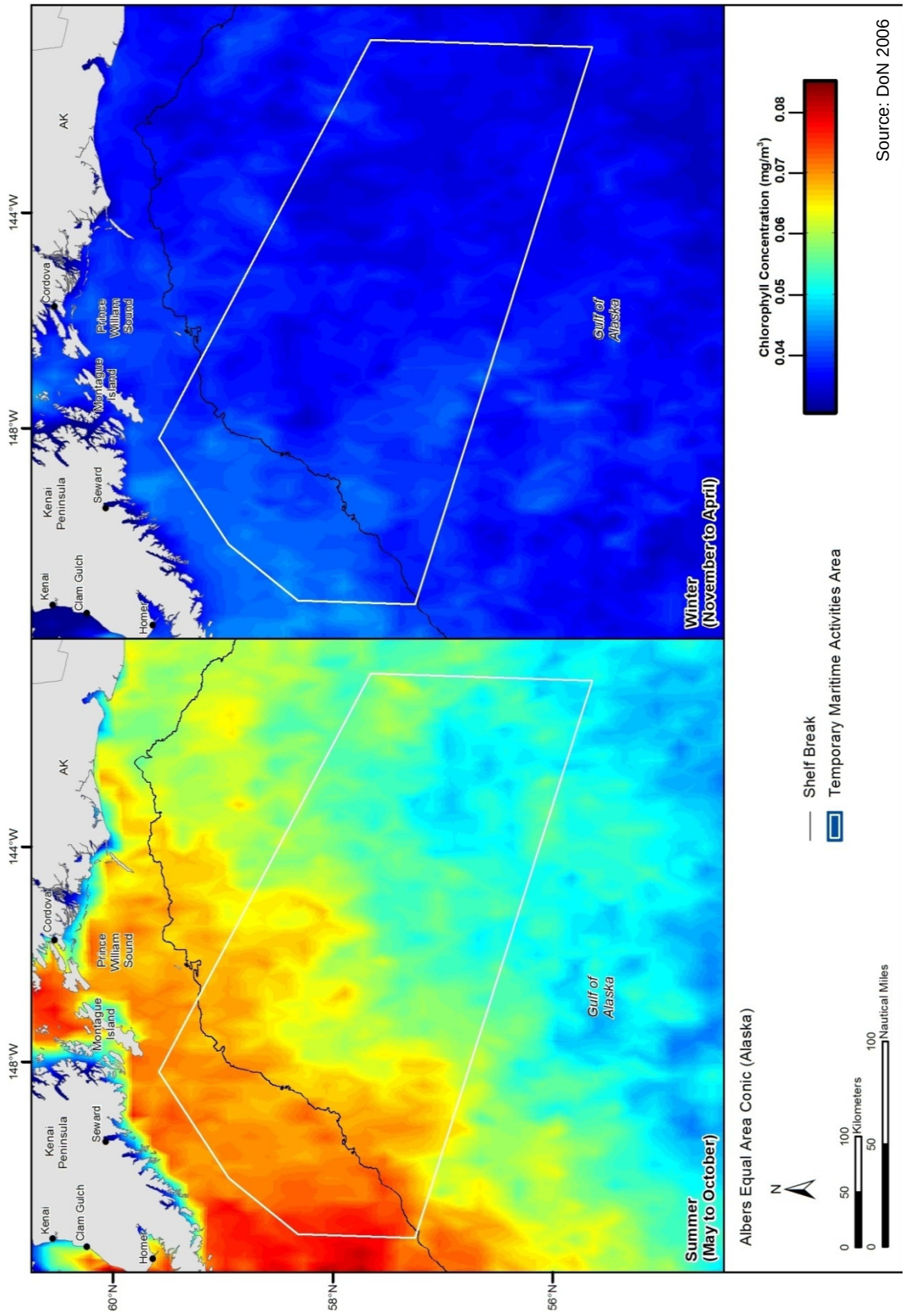


Figure 3.5-3: Seasonal Distribution of Chlorophyll throughout the TMAA and surrounding Vicinity during Summer (May through October) and Winter (November through April)

Offshore and the Alaskan Gyre

The basin of the GOA is a high-nutrient, low-chlorophyll environment (Ladd et al. 2005b). As a result of winter mixing combined with advection, phytoplankton in the center of the basin are supplied with sufficient nutrients for growth (Wheeler 1993). However, due to iron limitation, concentrations of chlorophyll remain low (approximately 0.3 milligrams [mg] chl/cubic meter [m^3]) throughout the year and production does not reach the levels seen in coastal regions (Sambrotto and Lorenzen 1986, Martin et al. 1989, Boyd et al. 1995). The phytoplankton community comprising the oceanic euphotic zone is dominated year-round by very small phytoplankton including small diatoms, naked flagellates, and cyanobacteria (Sambrotto and Lorenzen 1986, Booth 1988). Most of these organisms are smaller than 10 µm in size. The smallest of these phytoplankton include phototrophic bacteria, coccoid cyanobacteria, and picoplankton (<1 to 3 µm); these classes are considered to be the most important phytoplankton in open ocean gyres (Sherr et al. 2005). Unlike the coastal regions of the GOA, the outer shelf and deep ocean regions do not undergo seasonal blooms in phytoplankton abundance (Cooney 2005, Mundy and Cooney 2005).

Zooplankton

Zooplankton is a term for microscopic (< 2 µm) to small animals (2 to 20 cm) that live in the open ocean. Examples include ciliates; a wide variety of crustaceans such as copepods and krill (euphausiids); and the eggs, larvae, and juvenile stages of organisms ranging in complexity from jellyfish to fish (Kideys 2002).

Most zooplankton feed on phytoplankton. The zooplankton, in turn, serves as an important food source for other organisms, including fishes and whales. Copepods and krill are the two most important food sources for adult pelagic fish and baleen whales. Krill usually live at depths beyond the range of surface-feeding animals, but during swarming, large numbers may migrate to the surface within reach of flocks of birds (Sheard 1953, Boden et al. 1955).

Shelf waters in the GOA host a traditional plankton community in which large phytoplankton (diatoms and dinoflagellates) are grazed upon by copepods (Cooney 1986b, Sambrotto and Lorenzen 1986, Incze et al. 1997, Coyle and Pinchuk 2003, Cooney 2005, Coyle and Pinchuk 2005). The dominant zooplankton that inhabit the GOA are copepods and cnidarians, and abundance and species composition is largely driven by local salinity (Coyle and Pinchuk 2003). In addition to copepods, larger micronektonic species (e.g., euphausiids, amphipods, and some shrimp species) can be important zooplankton components in the diets of local fish and large predators (Coyle and Paul 1992, Incze et al. 1997, Boldt and Haldorson 2003). Highest levels of biomass tend to occur in the summer months of May (copepods) and August (cnidarians); lowest values tend to occur in February (Coyle and Pinchuk 2003, Zamon and Welch 2005). Cross-shelf distribution of zooplankton is influenced by their depth preferences, migration behavior, salinity and temperature preferences, and water movement. A mid-shelf transition region also can be identified where the zooplankton community is composed of a mixture of neritic and oceanic species (Coyle and Pinchuk 2005).

Grazing by the larger mesozooplankton (i.e., copepods) accounts for only a small percentage of phytoplankton mortality in the Alaska Gyre (Mackas and Tsuda 1999). Rather, production of phytoplankton in the oceanic regions of the GOA is thought to be controlled by an assemblage of microzooplankters and microconsumers, represented by abundant ciliate protozoans and small flagellates, rather than by large copepods (Miller et al. 1991a, Miller et al. 1991b, Booth et al. 1993, Dagg 1993, Frost 1993). Because the growth rates of these grazers are higher than those of the phytoplankton, it is hypothesized that these consumers are capable of efficiently tracking and limiting the overall oceanic productivity by eating the primary producers (Banse 1982, Taniguchi 1999). Oceanic zooplankton in the upper layers of the water column exhibit marked seasonality. In the late winter, biomass of zooplankton in the region increased 5-fold to 100-fold (values increase from 5 to 20 mg/m^3 in the winter to 100 to 500

mg/m^3 in the mid-summer). During this increase, copepods dominate the zooplankton community (Cooney 1986a, 1986b; Hood 1986; Landry and Lorenzen 1989; Cooney 2005).

Many of the zooplankton inhabiting the GOA migrate diurnally over 330 ft (100 m) or more. These migrations may interact with vertical or horizontal currents in ways that create localized swarms and patches of plankton in the region (Mundy and Cooney 2005, Weingartner 2005).

El Niño events have little effect on the phytoplankton composition within the shelf waters of the GOA (Coyle and Pinchuk 2003, Zamon and Welch 2005). Horizontal expansion of zooplankton stocks occur during warm periods of the Pacific Decadal Oscillation (PDO) along the coast. Both El Niño and the PDO affect the phytoplankton assemblage in the oceanic regions. Following the shift to a positive (warm) PDO regime in the late 1970s, zooplankton biomass doubled in the offshore regions of the GOA (Brodeur and Ware 1992, McFarlane and Beamish 1992, Brodeur et al. 1996, Francis and Hare 1997). During an El Niño event, a shallower mixed layer restricts the supply of nutrients to the ocean surface. In turn, the entire GOA experiences extreme nitrate depletion and decreased levels of primary production. Zooplankton become depleted as their food source is not as abundant (Freeland 2000).

Pelagic Invertebrates

Open-ocean or pelagic invertebrates inhabiting the GOA consist of "jellies"—jellyfish (cnidarians), comb jellyfish (ctenophorans), and salps (chordates)—plus a wide variety of other animals, including shrimp (decapods), gastropods, and polychaete marine worms. Most of these animals filter the sea water for plankton. Salps are more abundant in phytoplankton-rich surface waters, but have been found at depths to 3,300 ft (1,000 m). Many of these soft-bodied invertebrates are important sources of food for sea turtles.

Open Ocean Deepwater Benthic Habitats

The variety of bottom substrates and the complicated system of water circulation and bathymetry in the GOA results in a complex benthos (Chikuni 1985). The distribution of the benthos in the GOA is primarily a function of depth (i.e., light penetration, temperature, and wave action) and substrate (i.e., availability and type of substrate and movement and accumulation of sediments; Maragos 2000).

In addition, the distribution, diversity, and abundance of the benthos of the GOA are strongly influenced by the Alaska Coastal Current in conjunction with heavy sediment loads that originate from glacial meltwater. The GOA has a relatively wide shelf (up to 54 nm [100 km]) with several banks bisected by submarine canyons. Most regions of the GOA shelf experience high sedimentation rates of clayey silt that results in poorly consolidated sediments; however, in some relatively shallow areas, few sediments accumulate because of scouring by strong bottom currents and frequent winter storm waves. The megahabitats (delineated by water depth) of the GOA include the continental shelf (<660 ft [<200 m]), upper slope (~660 to 9,900 ft [200 to 3,000 m]), submarine canyons (660 to 1,320 ft [200 to 400 m]), and abyssal plain (~9,900 to 16,500 ft [3,000 to 5,000 m]). Over 400 infaunal invertebrate taxa, representing 11 phyla, and approximately 180 epifaunal species, representing 10 phyla, have been described along the continental shelf. Over the entire shelf of the GOA, the mean diversity and species richness was highest on banks and at the shelf break (Feder and Jewett 1986). The more offshore areas of the GOA, the continental slope and abyssal plain, are characterized as having substrata with large grain sizes (e.g., boulders, cobble) that provide macrohabitats to support a diversity of organisms including groundfish and rich epifaunal communities (e.g., coral, sponges, anemones, bryozoans). Since many deepwater areas are characterized by stable environments dominated by long-lived species, the potential impacts of fishing on these areas can be substantial (U.S. Department of Commerce, National Oceanic and Atmospheric Administration [USDC, NOAA] 2005). The following are summaries of each megahabitat.

Continental Shelf

Much of the continental shelf is covered with sand, mud, silt, bits of broken shell, and other fine materials that are often inhabited by organisms living within the upper layers of the seafloor (infauna) or on the surface of these seafloor substrates (epifauna). The benthic invertebrate fauna of the GOA differs markedly as a function of bottom type. Epifauna live attached to or rove over the sediment surface wherever suitable substrate occurs. For example, sponges, barnacles, anthozoans, soft corals, ascidians, sea whips, sea pens, mussels, and bryozoans are distributed throughout the continental shelf of the GOA, many of which provide important structure to the soft sediment seafloor. Infaunal invertebrates such as polychaetes, clams, nematodes, and amphipods burrow into sand and mud bottoms and stabilize the sediments. These benthic invertebrates serve as prey for mobile epibenthic invertebrates and for demersal fishes. In the GOA, common predatory invertebrates include sea stars (e.g., leather [*Dermasterias imbricate*] and sunflower star [*Pycnopodia helianthoides*]), crabs (e.g., helmet, Dungeness, king, snow, and Tanner crabs), shrimp (*Carangon* and *Pandalus* shrimps), gastropods, and some scavenging invertebrates (AMCC [Alaska Marine Conservation Council] and ASG [Alaska Sea Grant] 2003, Peterson 2005).

The shelf of the GOA is a complex and dynamic geologic environment characterized by banks, patchy rocky substrate, and patchy bottom sediments. Banks are exposed to both wave and current action (particularly during winter storms) that continually resuspend bottom sediments. Bottom material such as sand, gravel, boulders, and broken shells are most characteristic of the banks while finer sediment accumulates in the depressions and the troughs of the region. Sessile suspension feeders are most abundant at the shelf edge with the biomass exceeding 9.9 ounces/ square foot (ft^2) (3,000 grams [g]/square meter [m^2]) in some regions. Mobile suspension feeders occur mainly in two areas: 1) on the plateau-like surfaces of the shelf in areas with smooth relief and predominance of sand sediments and 2) on the sides of troughs and canyons. Selective deposit-feeders comprise 15 percent of the total biomass of the shelf and are most common between 172 and 521 ft (52 and 158 m) on bottoms covered with fine-grained sand or muddy sediments that are characterized by a smooth relief (Feder and Jewett 1986).

In the TMAA, the benthos of Portlock Bank was surveyed in water depths from about 165 to 2,475 ft (50 to 750 m). The seafloor is generally flat and covered with small boulders, cobble, and gravel. The most common epifauna were crinoids, small nonburrowing sea anemones, glass sponges, stylasterid corals, and brittlestars. The glass sponges and stylasterid corals found attached to the boulders were larger than those observed on the surrounding seafloor (Heifetz et al. 2003).

Sponges - The distribution of sponges (Phylum Porifera) in the GOA is patchy. However, there are four common sponges found in the GOA. The barrel sponge (*Halichondria panicea*) is a large, thick-walled colony. Although highly variable in shape, the barrel sponge can reach a maximum height of 12 inches (in) (30 cm). The cloud sponge (*Aphrocallistes vastus*) is an upright sponge that grows to 12 in (30 cm) in height. The hermit sponge (*Suberites ficus*) is a small sponge (less than 6 in [15 cm] in height) that grows over snail shells. The tree sponge (*Mycale loveni*) forms a hard, tree-like skeleton surrounded by soft sponge and attains a maximum height of 10 in (25 cm) (USDC, NOAA 2005). Sponges provide prime habitat for red king crab (*Paralithodes camtschaticus*), rockfish, and Atka mackerel (*Pleurogrammus monopterygius*) (AMCC and ASG 2003).

Bryozoans - Bryozoans are small colonial animals that are common on hard substrates (i.e., rock, live and dead bivalve and gastropod shells, and crab shells). Roughly two-thirds of the known species in the region are low-profile encrusting forms. In the GOA, the bryozoans, *Flustrella* sp. and *Dendrobeania* spp., have been associated with the largest catches of juvenile red king crab, suggesting that bryozoans provide prime habitat for these crabs (USDC, NOAA 2005).

Hydroids - Hydroids are small, mostly colonial, cnidarians; in the GOA, approximately 200 species have been identified. Most hydroids are erect, tree-like, and grow no taller than 6 in (15 cm); other hydroids encrust on mollusk shells, rock, and other hard surfaces. In the GOA, hydroids are considered to be the main food source of juvenile red king crab (USDC, NOAA 2005).

Ascidians - Ascidians, small sedentary marine invertebrates with a saclike body, include members of the genus *Boltenia* (sea onions), *Styela* (sea potato), and *Halocynthia* (sea peach). In the GOA, sea onions, sea potatoes, anemones, and sponges typically cover the sandy seafloor at depths of 83 to 330 ft (25 to100 m) (AMCC and ASG 2003, USDC, NOAA 2005). Sea onions are stalked, solitary ascidians with a white or pinkish bulb-like body that floats in the water column and is tethered to the bottom by a stalk; the entire animal reaches up to 30 cm or more in length. Two species of sea onions, *Boltenia ovifera* and *B. villosa*, are commonly found in the GOA. Compound ascidians, bryozoans, and hydroids frequently attach to the stems and holdfasts of sea onions. Sea onions and associated attached invertebrates are known to provide habitat to small juvenile red king crab. Sea potatoes are dark brown and have a potato-shaped body that can reach a maximum size of 4 in (10 cm). They grow in clumps that permanently attach to snail, clam, or other invertebrate shells. The sea peach, *Halocynthia aurantium*, is a large (up to 7 in [18 cm]), ascidian that is often found in groups. It has a smooth or wrinkled red-orange outer covering with a barrel-shaped body that attaches directly to the substrate (USDC, NOAA 2005).

Anthozoans - Anthozoans are a large taxonomic group that include sea raspberries (*Gersemia* sp.), a soft coral whose groups of small polyps, when inflated, form thick, soft, red lobes in colonies that can reach a height of 10 in (25 cm). When contracted, the colony has a "brain-like" appearance and is considerably smaller. Two species of sea raspberries that are found in the GOA, *G. rubiformis* and *G. fruticosa*, have the widest temperature and substrate preference range of all Alaskan soft corals (AMCC and ASG 2003). Anthozoans also include sea anemones, sea pens, sea whips, and corals, all of which can form dense concentrations in the GOA (USDC, NOAA 2005).

Sea whips and sea pens - Some of the most distinctive groups of long-lived, habitat-forming organisms are the sea whips and sea pens (order Pennatulacea). Sea whips and sea pens can reach a length of 1.5 m or more and can be found on soft substrates at depths greater than 26 ft (8 m) but are more common at greater depths and have been found in depths as great as 300 ft (91 m) (USDC, NOAA 2005). However, several genera are typically collected most frequently at depths exceeding 3,300 ft (1,000 m) worldwide and are known from 1,650 to 3,300 ft (500 to 1,000 m) in the GOA, e.g. *Anthoptilium* spp. (DoN 2006). In the TMAA, the sea whips, *Protoptilum* sp. and *Halipteris willemoesi*, have been found in densities as high as 10 individuals per m^2 and sea pens, such as *Ptilosarcus gurneyi*, have been found in dense aggregations at depths less than 99 ft (30 m) (USDC, NOAA 2005).

Stands of sea whips and sea pens provide vertical relief to otherwise flat habitats and shelter for many organisms including gadids (e.g., pollock), rockfish, crab, and the Pacific ocean perch, *Sebastes alutus* (AMCC and ASG 2003; USDC, NOAA 2005). A clear relationship exists between sea whip and sea pen abundance and the diversity of marine life. For example, worms, bivalves, sea cucumbers, basket stars, shrimps, several species of flatfishes, small octopuses, and squids are often found in sea whip and sea pen habitats (AMCC and ASG 2003).

Coral communities - Etnoyer and Morgan (2003, 2005) synthesized data on the occurrence of habitat-forming deep-sea corals in the Northeast Pacific Ocean. Deep-sea corals are typically found from the edge of the continental shelf to the continental rise, on banks, and on seamounts (Freiwald et al. 2004). While the mean depth range of deep-sea corals in the Northeast Pacific Ocean is 875 to 4,165 ft (265 to 1,262 m), deep-sea corals are known to occur in the GOA from the shoreline to the upper slope (3.3 to 2,789 ft [1 to 845 m]) water depth range; Heifetz 2002, Marine Conservation Biology Institute [MCBI] 2003, Etnoyer and Morgan 2005).

True deep-sea coral communities live in complete darkness, in temperatures as low as 39 degrees Fahrenheit (°F) (4 degrees Celsius [°C]) and in waters as deep as 19,800 ft (6,000 m); therefore, they are also known as "cold-water coral reefs" (Freiwald et al. 2004). Deep-sea corals lack the symbiotic zooxanthellae found in tropical reef-building corals. Thus, deep-sea corals do not benefit from a carbon supply provided by symbiotic algae but rather survive solely on suspension feeding. The biological diversity of deep-sea corals communities is high; from an economic perspective, this diversity creates valuable habitat for several commercially fished species (Witherell et al. 2000, Gass 2003).

Deep-sea coral communities usually consist of sessile stony corals (Order Scleractinia), soft corals (Sub Class Octocorallia), black corals (Order Antipatharia), and lace corals (Order Stylasterina) (Freiwald et al. 2004, Hain and Corcoran 2004, Roberts and Hirshfield 2004). These corals can build very large 3D structures in deep-sea environments that are comparable in size and complexity with coral reefs that occur in shallow tropical waters. Deep-sea coral assemblages provide habitat to thousands of species including sponges, polychaetes (or bristle worms), crustaceans (crabs and lobsters), mollusks (clams, snails, octopuses), echinoderms (starfish, sea urchins, brittle stars, feather stars), bryozoans (sea moss), and fish (Freiwald et al. 2004). Yet, much like shallow-water corals, deep-sea corals are fragile and slow growing: thus, they are vulnerable to human-induced physical impacts (Andrews et al. 2002, Roberts and Hirshfield 2003, Freiwald et al. 2004, Roberts and Hirshfield 2004).

The overall size of deep-sea coral communities can range from patches of small solitary corals to massive reef structures (mounds, banks, and forests) several meters to tens of kilometers across and a meter to tens of meters high (Tucker and Wright 1990, Cairns 1994). The red tree coral, *Primnoa pacifica*, found in the GOA (33 to 2,640 ft [10 to 800 m] water depth), can reach 9.9 ft (3 m) in height and 23.1 ft (7 m) in width and achieve over 100 years of age (Heifetz 2000, Andrews et al. 2002, Heifetz 2002, Cairns and Bayer 2005). Bamboo corals (Family Isididae), found at 2,310 ft (700 m) water depth in the GOA, Warwick Seamount (48°3' north [N], 132°44'W), were 75 to 208 years old and their growth rates ranged from 0.05 to 0.16 millimeters (mm)/year (yr) (Roark et al. 2005).

Trawls and heavy fishing gear used by commercial fishing have caused severe damage to deep-sea coral communities in many areas of the world including the GOA (Freese et al. 1999, Roberts and Hirshfield 2004). Deep-sea coral communities are also susceptible to physical impacts caused by oil- and gas-related activities, cable laying, seabed aggregate extraction, shipping activities, the disposal of waste in deep waters, coral exploitation, mineral exploration, and increased atmospheric carbon dioxide (CO_2) (Gass 2003, Freiwald et al. 2004, Roberts and Hirshfield 2004). It may take decades to centuries for physically damaged deep-sea coral communities to recover (Freiwald et al. 2004, Roberts and Hirshfield 2004). The recovery of the deep-sea corals is particularly slow not only because of slow growth rates but also because larvae production is positively related to the size of the parent coral colony. Further, some damaged colonies will first devote energy to making repairs before sexual reproduction takes place (Andrews et al. 2002).

Corals in Alaskan waters are found in the GOA, the Aleutian Islands, and the Bering Sea (Heifetz 2002, MCBI 2003). The known distribution of deep-sea corals is contained to water depths that are shallower than 2,970 ft (900 m); however, given the general distribution of deep-sea corals in the Northeast Pacific Ocean it is likely that deep-sea corals occur at greater depths and over a broader geographical extent. In the GOA, the distribution of corals may extend beyond the 2,970 ft (900 m) isobath (Freiwald et al. 2004, Hoff and Stevens 2005). In a recent survey of seamounts in the Kodiak-Bowie Seamount Chain (Kodiak Seamounts), diverse deep-sea coral communities (including new coral species; tentatively belonging to the Primonidae, Isididae, and Antipathidae coral families) and associated invertebrates and fishes were documented in the deep-sea coral distribution database; however, these recent discoveries have yet to be reported in the peer-reviewed literature (Tsao and Morgan 2005).

There are a total of 105 known coral species in Alaskan waters including soft corals, gorgonians, sea pens, sea whips, cup corals, black corals, and hydrocorals (Wing and Barnard 2004). The locations of 14 coral taxa mapped in the GOA include antipatharians (Family Antipathidae), gorgonians (Families Corallidae, Isididae, Paragorgidae, Primnoidae), and hydrozoans (Family Stylasteriidae; Heifetz 2002, MCBI 2003; Figure 3.5-4). Yet the most common coral taxa encountered in the GOA are cup corals (unidentified scleractinians; 31 percent of coral records) and gorgonians (mostly *Callogorgia* and *Primonoa*; ~45 percent of coral records; Heifetz 2002). For comparison, there are 43 coral taxa known for the Aleutian Islands and 8 coral taxa for the Bering Sea. The cup corals found in the GOA are probably of the genera *Balanophyllia* (occurring in waters depth ranging from 0 to 40 ft [12 m]) and *Caryophyllia* (40 to 13,200 ft [12 to 4,000 m]; USDC, NOAA 2005). Black corals (antipatharians) are found throughout the GOA in water depths ranging from 1,320 to 3,300 ft (400 to 1,000 m) (USDC, NOAA 2005). Gorgonians are the most abundant coral taxa in the Aleutian Islands, and soft corals are the most abundant in the Bering Sea (Heifetz 2002). Gorgonians and cup corals occur throughout the Aleutian Islands but have a patchy distribution in the GOA, including substantial patches located off the Kenai Peninsula. Hydrocorals (Order Stylasterina) and soft corals (Order Alcyonacea) are found in a few small patches in the GOA (Heifetz 2002).

Because of their abundance, size, and longevity, red tree corals form essential habitat for fishes and invertebrates. Krieger and Wing (2002) observed colonies of *Primnoa* spp. in the southeast GOA (531 to 1,205 ft [161 to 365 m] water depth) that were used as habitat by rockfish (e.g., rougheye [*Sebastes aleutianus*], redbanded [*S. babcocki*], shortraker [*S. borealis*], sharpchin [*S. zacentrus*], dusky [*S. ciliatus*], and yelloweye [*S. ruberrimus*]), sea stars (e.g., *Hippasteria heathi*), nudibranchs (e.g., *Tritonia exulans*), crinoids (e.g., *Florometra* sp.), basket stars (e.g., *Gorgonocepahlaus eucnemis*), golden king crab (*Lithodes aquaspina*), shrimps, snails, anemones (e.g., *Cribinopsis* spp., *Stomphia* spp., and *Tealia* spp.), and sponges. Seastars, nudibranchs, and snails found on the *Primnoa* colonies were feeding upon and damaging coral polyps. Crinoids, basket stars, anemones, and sponges used *Primnoa* as a substrate for attachment in an effort to filter feed while suspended off the surrounding seafloor. Rockfish, shrimp, and crabs sought refuge within the branches of the *Primnoa* colonies (Krieger and Wing 2002). In the GOA, *Primnoa* colonies have been harvested for jewelry (200 kilograms [kg]/yr) from 1997 to 2001 (Krieger and Wing 2002). Deep-sea corals, including colonies of *Primnoa*, were accidentally but indiscriminately destroyed by commercial bottom trawling (Krieger and Wing 2002, Etnoyer and Morgan 2005). Increased use and geographic expansion of bottom-impacting fishing gear are likely to negatively impact deep-sea coral habitats and associated species. The regulation of fisheries by regional fishery management councils can protect deep-sea coral ecosystems that are currently impacted and prevent the destruction of unexploited areas by using science-based information (surveys and mapping) to implement an ecosystem-based approach (Freese et al. 1999, Witherell et al. 2000, Andrews et al. 2002, Frame and Gillelan 2005).

Corals in the TMAA are known in water depths ranging from 3 to 2,789 ft (1 to 845 m) (MCBI 2003; Figure 3.5-4). As noted earlier they occur in deeper water and over a broader expanse potentially including Dall Seamount found within the TMAA. Known corals in the TMAA include antipatharians (Family Antipathidae), gorgonians (Families Corallidae, Isididae, Paragorgidae, and Primnoidae), and hydrozoans (Family Sytlasteriidae; MCBI 2003). However, this area has not been fully sampled and deep-sea corals are likely to occur in deeper water and over a broader expanse within the TMAA (MCBI 2003).

Continental Slope

In addition to substrate, the species composition of the benthos in the GOA changes significantly with water depth. The bottom substrate of the continental slope is typically covered with silts, clays, and fine sediments; however, there is the occasional hardbottom substratum (e.g., rocky outcroppings, rubble, talus, vertical wall, and seamounts) that supports a diverse assemblage of deep-sea invertebrates and fishes.

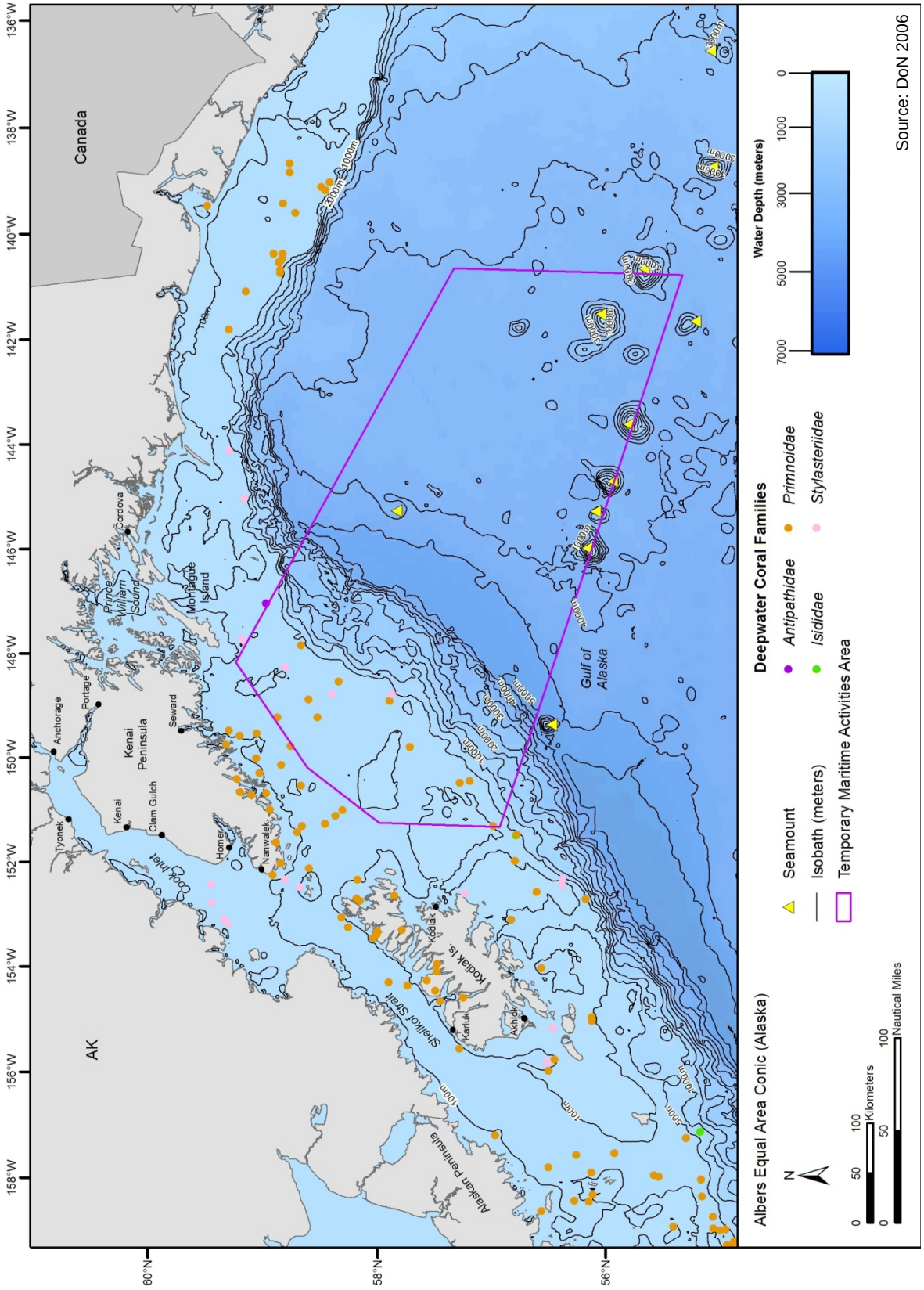


Figure 3.5-4: Coral Communities (hydrozoans & anthozoans) of the TMAA & Surrounding Vicinity

Bottom substrate type governs the abundance and diversity of deep-sea organisms. Abundance and diversity are generally higher on hard, irregular substrates than on smooth, hard surfaces (Lissner 1988). Although there have been many descriptive studies detailing the community assemblages on the continental shelf, habitats on the continental slope and deeper are challenging to study because they usually lie beyond the range of self-contained underwater breathing apparatus (SCUBA) and mechanical sampling is difficult (Airamé et al. 2003). Therefore, the outer continental shelf and the continental slope are not well studied in the GOA system. There has been some description of the mobile epibenthic communities and the demersal fish communities (Feder and Jewett 1986); however, most sampling of the continental slope habitats involves trawling and focuses on the commercial fisheries of crabs, shrimps, and demersal fishes. The continental shelf represents key fishing areas in the GOA and has correspondingly high value to humans. Because trawling can dramatically modify and damage the community structure of benthic biogenic habitats such as sponges and soft corals from equipment dragging along the sea floor, this human fishing activity is an object of concern (Peterson 2005).

Submarine Canyon Communities

The GOA continental shelf and slope is highly dissected by numerous submarine canyons. Submarine canyons contain various habitats, including vertical cliffs, ledges, talus, cobble and boulder fields, and soft mud. Generally, rocky substrate lines steep canyon walls, whereas the bottom of the canyon is formed of a gently sloping bottom that accumulates sediments to form the soft substrate (e.g., silt and mud). The organisms that live in submarine canyon habitats must be able to withstand extreme conditions—depths in excess of 1,650 ft (500 m), little or no light, cold water temperature, and tremendous pressure (up to 318 atmospheres; Airamé et al. 2003).

Some of the production associated with submarine canyons is introduced via adjacent habitats. Drift macroalgae and other organic matter produced in shallow or surface waters may settle and accumulate at the mouth and along the slopes of submarine canyons. This detritus may be washed down into the canyon during storms, contributing to productivity in the deep sea. In addition, the soft substrate at the base of the canyons supports a diverse invertebrate community. The complex structure of rocky substrate in submarine canyons provides cover for numerous fish species (e.g., groundfish) and can help to protect these species from overfishing because they tend to be difficult to locate and target. However, submarine canyons are vulnerable to human activities; they extend across a range of depths and may be heavily influenced by the deposition of sediments and pollutants that is associated with coastal development (Airamé et al. 2003).

Abyssal Plain

In the GOA, the abyssal plain extends from the bordering continental rises to the south and the mid-oceanic ridge to the west; it is a relatively flat expanse of sea floor that is 9,900 to 16,500 ft (3,000 to 5,000 m) below sea level. Abyssal plains are covered with fine particles that constantly rain down from the overlying water column. These particles, fine, clay-sized sediments and the remains of marine life, drift slowly downward filling in depressions on the irregular rocky ocean floor. They have accumulated to make up the 16,500 ft (5,000 m) thick sediment bed that constitutes the largest portion of the ocean basin (Airamé et al. 2003). Because of this thick layer of sediment, abyssal plains are among the smoothest surfaces on the planet, with less than 5 ft (1.5 m) of vertical variation for every mile. In a few places, extinct volcanoes or seamounts disrupt the monotony of the abyssal plain (Wilson 1976; Beaulieu 2001a, 2001b; Cunha and Wilson 2003; O'Dor 2003). The abyssal plain is regarded as the true ocean floor and is characterized by extremely cold water, no light, and extremely diverse marine inhabitants (e.g., deep sea isopods, polychaetes, worms, sponges, crustaceans, and sea stars) that are adapted to near freezing temperatures and immense pressure (Smith 1991). The deep sea is one of the largest and least explored ecosystems on Earth and is a major reservoir of biodiversity and evolutionary novelty.

Significant physical, chemical, and biological interactions occur between the upper ocean and the deep benthos on time scales of days to millennia (Airamé et al. 2003). Benthic communities that live within, upon, or associated with the ocean bottom rely upon the input of detritus (e.g., marine snow) from the surface waters; this sinking detritus provides the primary source of nutrients for bathypelagic and deep-sea communities. On average, less than 3 percent of primary production sinks through the water column to the deep sea; however, in the northeastern Pacific Ocean, where production is particularly high, approximately 5 to 15 percent of the surface production eventually reaches the deep sea. Deep benthic fauna living on or in the benthos grow more slowly, live longer, have smaller broods than animals living in shallow waters, and although consumption is slow, once organic matter reaches the sea floor, it is almost entirely consumed; a very small portion of the organic matter may dissolve or become buried in sediments (Grassle 1991).

In spite of these extreme conditions, the deep sea supports a remarkable diversity of organisms (Airamé et al. 2003). Due to the unpredictable and patchy supply of food, organisms in the deep sea use a variety of foraging strategies. Many deep-sea animals are "sit-and-wait" predators, while others are active scavengers that break down carcasses on the sea floor, attracting slower-moving animals, such as mollusks, sea stars, brittlestars (ophiuroids), and sea cucumbers. In many areas of the deep sea, ophiuroids are the dominant megafauna; they are often found around sea pen (Pennatulacea) beds and are so abundant that their feeding behavior and high activity levels can alter the ecology of benthic softbottom communities.

Seamounts

Seamounts are isolated mountains rising from 2,970 to 9,900 ft (900 to 3,000 m) above the surrounding bottom. Seamounts are found in all oceans but are more numerous in the Pacific Ocean, with over 2,000 having been identified (Thompson et al. 1993). Very little research has been conducted on seamounts; they are among the least understood habitats in the ocean basins (Rogers 1994). Seamounts provide a unique habitat for both deep-sea and shallow-water organisms due to the large ranges of depth, hard substrate, steep vertical gradients, cryptic topography, variable currents, clear oceanic waters, and geographic isolation that characterize seamount habitats (Rogers 1994). Thus, seamounts are capable of supporting a wide range of organisms (Wilson and Kaufmann 1987). The most common invertebrates found on seamounts worldwide are cnidarians and the most common fishes are scorpaenids and morids (Wilson and Kaufmann 1987). The abundant and diverse benthic fauna consists of a wide array of sponges (including large brilliant-yellow barrel sponges that have been known to support intrinsic communities), coral (including large gorgonians and huge golden coral sea fans), brittlestars, crinoids, clams, seastars, polychaetes, crabs, tunicates, sea urchins, sea cucumbers, and octopi (Rogers 1994). Seamounts attract various predators, including fishes and marine mammals as a result of this relatively high biomass.

A total of 597 invertebrate species have been recorded from seamounts in studies that have been conducted worldwide (Wilson and Kaufmann 1987). A rich and diverse benthic fauna with a high degree of endemism exists on seamounts. In one study, levels of endemism among 850 macro- and megafaunal species (including fish) were as high as 29 to 34 percent (Richer de Forges et al. 2000). Thus, seamounts can function ecologically as island groups or chains, leading to localized species distributions with apparent speciation. Dispersal of organisms from the seamounts is likely an active and a passive process; seamounts appear to provide "stepping stones" for transoceanic dispersal of animals in both the Atlantic and Pacific Oceans (Richer de Forges et al. 2000; Johnston and Santillo 2004). Few studies have investigated the interaction between seamount-inhabiting organisms and the surrounding abyssal plain, nearshore area, and other seamount habitats.

Seamount communities are extremely vulnerable to the impacts of fishing. Some seamount fish and benthos are already known to have been seriously impacted by fishing activities (Johnston and Santillo

2004); their recovery is complicated by the limited fixed habitat, the extreme longevity of many species (on the order of 100 years and more), and the slow or limited recruitment between seamounts (Richer de Forges et al. 2000). The global status of seamount benthic communities is unknown; however, the limited distribution of seamount biota greatly increases the threat of extinction. The conservation and protection of seamount communities is necessary and requires action to be taken on a local scale (O'Dor 2003).

There are several seamounts located in the TMAA (Figure 3.5-5). The coral and rocky relief that are associated with the Dall seamount are known to provide shelter for adult and juvenile rockfish, greenlings, and ling cod and attachment substrates for hydrocorals and red tree corals. With further explorations some undiscovered pinnacles and seamounts will undoubtedly be identified; this exploration will help to unveil their ecological value to the surrounding ocean habitats. For example, deep-sea explorers of seamounts in the GOA have discovered that lingcod spawn in very deep water at the base of pinnacles and seamounts and giant spider crabs have been discovered that span over 7 feet across. Some pinnacles, such as the Albatross Pinnacle south of Kodiak Island, come close to the surface and provide a substrate for kelp that in turn provide essential rearing habitat for juvenile fish. These pinnacles are known to be covered with sponges, anemones, hydroids, tunicates, barnacles, crabs, worms, snails, chitons, and other invertebrates and algae (AMCC and ASG 2003).

Chemosynthetic Ecosystem

In a normal marine ecosystem, the primary producers (e.g., phytoplankton and seagrasses) produce energy through photosynthesis (a photosynthetic ecosystem). In methane- and sulfide-rich environments, chemolithoautotrophic bacteria (i.e., sulfur-oxidizing bacteria, methane-oxidizing bacteria, and sulfide-reducing bacteria) create the energy that can be used by the organisms in the environment (a chemosynthetic ecosystem; Hessler and Lonsdale 1991, Hashimoto et al. 1995, Galkin 1997). Some of the benthic fauna associated with chemosynthetic ecosystems contain symbiotic chemosynthetic bacteria inside their bodies to obtain essential nutrients (Nybakken 2001). Chemosynthetic communities are a significant source of biological productivity on the deep-sea floor. In some locations, vast fields of hydrothermal vents can support benthic communities (Fisher et al. 2000, Lanoil et al. 2001, Reed et al. 2002). In other locations, gas hydrates in the sediments support extensive chemosynthetic communities (Fujikura et al. 2002).

Chemosynthetic habitats are formed by a variety of geological and biological processes on continental margins, and despite their location in the deep sea, have high biomasses maintained by chemosynthetic bacterial production (Hessler and Lonsdale 1991, Hashimoto et al. 1995, Galkin 1997, Smith et al. 2003) Cold seeps, natural whale falls, hydrothermal vents, and wood falls provide specific habitat duration and each of these chemosynthetic habitats appears to foster a characteristic fauna (Fujikura et al. 2002, Smith et al. 2003). In general, chemosynthetic communities in the GOA are characterized by tubeworms, giant white clams, mussels, gastropods, and sponges (Anderson et al. 1993).

Cold Seeps

A cold seep (sometimes referred to as a cold vent) is a region of the seafloor that releases hydrogen sulfide, methane, and other hydrocarbon-rich fluids (Hashimoto et al. 1989, Kvenvolden 1993). Cold seep communities depend upon chemolithoautotrophic production associated with the emission of reducing chemicals from “cold” hypersaline brines or other hydrocarbon seeps such as methane hydrates (Airamé et al. 2003).

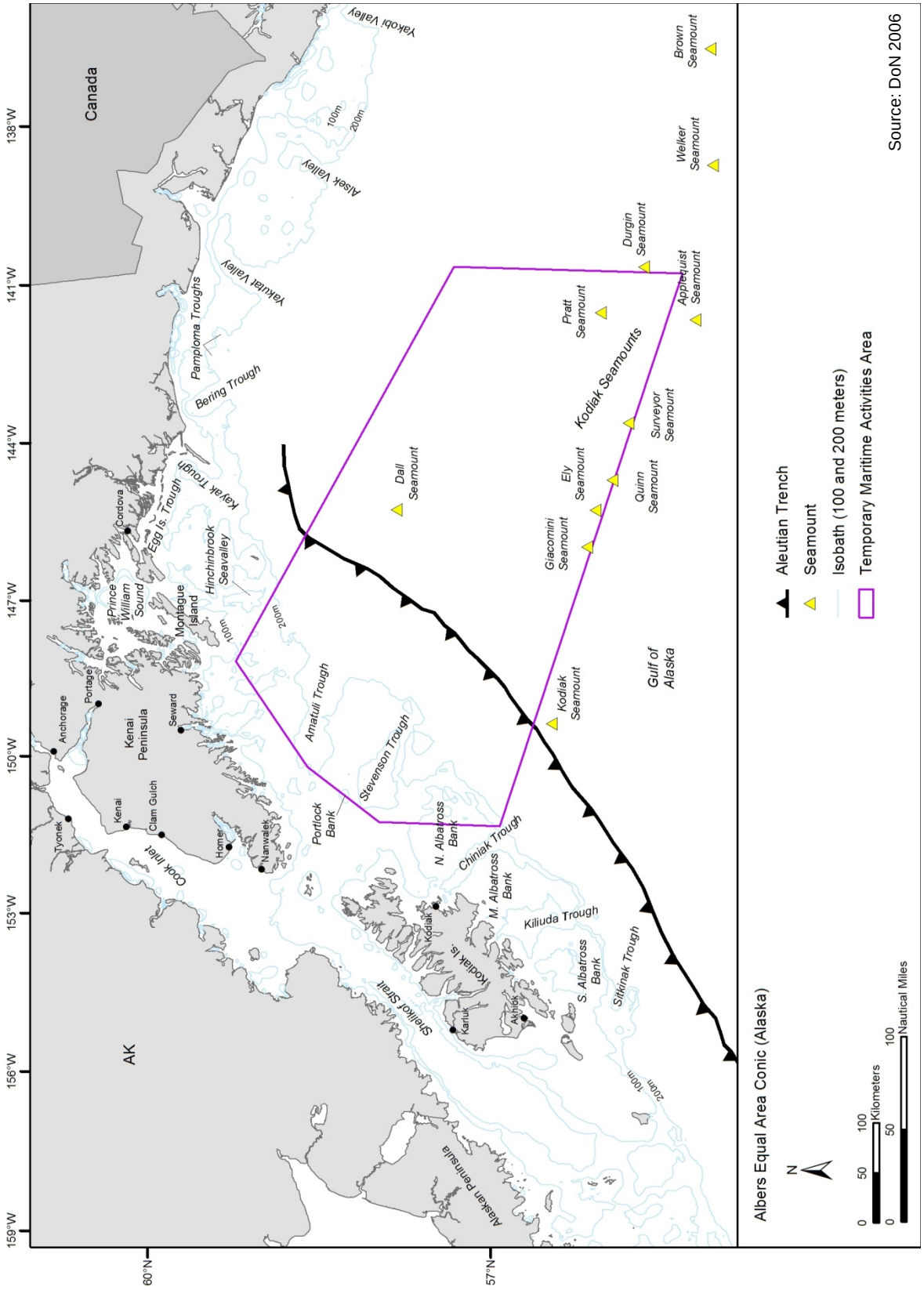


Figure 3.5-5: Major Geological Features of the TMAA and Surrounding Vicinity

Chemolithoautotrophic bacteria oxidize the reduced chemicals to form organic matter from carbon dioxide. Typically, cold seeps originate from relatively young sediments and are common along basin margins (Kvenvolden 1993). However, in recent years many seep communities have been reported in tectonically passive margins, active regions of plate collision, and along marginal basins (Schmidt 2004).

Cold seeps have formed along much of the GOA where the water is cold and the pressure is sufficient to support formation; although they are not known to occur in the TMAA, in the GOA region, two seep microhabitats were observed at 14,563 to 14,662 ft (4,413 to 4,443 m). These seep areas were populated by dense aggregations of *Calyptogena phaseoliformis* (clams), *Siboglinidae* (pogonophorans), and galatheid crabs (Levin and Michener 2002).

Whale Falls

Whale carcasses on the seafloor support a high abundance of organisms commonly found near seeps, vents, and other deep-sea hard substrates (Smith and Baco 2003). It has been estimated that at any given time there may be in excess of 500,000 sulfide-rich whale skeletons on the deep-sea floor (Smith et al. 2003). Whale falls promote high species diversity by providing hard substrates for settling, organic enrichment, and free sulfides on a typically organic-poor, sediment-covered sea floor (Smith et al. 2003); these whale falls can support productive communities of chemosynthetic organisms for decades. The falls of large whales yield massive pulses of organic matter to the deep-sea floor (Smith et al. 2003). The chemosynthetic communities associated with whale falls are probably the least known of the chemosynthetic ecosystems. Studies of whale falls have revealed that chemolithoautotrophic bacteria reside in, on, and around whale falls (Smith and Baco 2003). Sulfide diffuses out of the bone and provides the energy source for the chemolithoautotrophic bacteria (Bennett et al. 1994, Butman et al. 1995, Smith and Baco 2003).

Although whales have been much reduced throughout the world's oceans, Smith (1992) estimates that such sulfide-rich whale falls may have an average spacing of one per 14 nm (25 km) in the North Pacific and may give credence to the hypothesis that such falls may be the stepping stones that permit the sulfide-based communities to disperse over vast distances between the vent systems.

Artificial Habitat

Artificial habitats (shipwrecks, artificial reefs, jetties, pontoons, docks, and other man-made structures) are physical alterations to the naturally occurring marine environment. In addition to artificial structures intentionally or accidentally placed on the seafloor, fish aggregating devices are suspended in the water column and anchored on the seafloor to attract fish (Fager 1971, Bohnsack et al. 1991). Artificial structures provide a substrate upon which a marine community can develop (Ritter et al. 1999). Navigational, meteorological, and oceanographic buoys suspended in the water column potentially function like artificial habitats.

When solid, hard objects with numerous and varied surfaces are introduced to the seafloor, artificial substrates are provided for the settlement and colonization of epibenthic organisms (e.g., algae, sponges, barnacles, mussels, amphipods, soft corals, sea anemones, and hydroids; Ambrose and Swarbrick 1989, DeMartini et al. 1994). The initial colonization of artificial habitats works to build communities that increase marine production by providing an attachment substrate and a biotope suitable for larger motile organisms (e.g., starfish, lobster, crabs, fishes; Ritter et al. 1999).

Artificial habitat sites are often important nearshore locations for human activities including commerce, navigation, aquaculture, and recreation (Baine 2001). Fishermen often target these artificial habitats as they tend to provide food, shelter, and nurseries for a variety of demersal and pelagic fishes (including sport fishes) and many invertebrates (Seaman and Jensen 2000). Under optimal conditions, artificial

habitats benefit benthic communities and offshore/onshore economies. The benefits experienced by marine biological communities increase with time (Ambrose and Swarbrick 1989, DeMartini et al. 1994). There are a significant number of artificial habitats available for the marine communities in the GOA including shipwrecks, buoys, and moorings (Figure 3.5-6); however, in the TMAA, moorings and buoys are the only artificial habitats.

Buoys and Moorings

A buoy is a floating platform used for navigational purposes or for supporting scientific instruments that measure environmental conditions. Moorings are floating blocks used for scientific study of a particular area; instruments are usually fastened along the line, which is fixed firmly to the seafloor. Both buoys and moorings can act as a substrate for attachment and aggregation locations for pelagic fish. Currently, two buoys and twelve moorings are located in the TMAA, none of which are owned by the Navy (DoN 2006, Figure 3.5-6).

Federally Protected Areas

Marine Protected Areas

Marine Protected Area (MPA) is a general term for natural and cultural marine resources that are protected by federal, state, tribal, or local governments. There are many different kinds of MPAs, including national parks, wildlife refuges, monuments and marine sanctuaries, critical habitat for species of concern, state parks, and estuarine reserves. MPAs complement other management measures such as fishery regulations and pollution controls. Each of these areas is afforded varying degrees of protection under law.

Marine Management Areas (MMAs) are similar to MPAs, but encompass a wider range of management intents, including geological, cultural, or recreational resources, plus security zones, shellfish closures, sewage discharge areas, and pipeline and cable corridors. The primary difference between MPAs and MMAs is the duration of the site. MMAs must provide yearly protection for at least 3 months out of each year, and must provide a minimum of 2 years of protection. MPAs must be designated with the intention to become permanent. Seven sites are located within the TMAA and vicinity. Examples include the Alaska Maritime National Wildlife Refuge, Steller Sea Lion Protection Areas, Kachemak Bay Research Reserve, Katmai National Park and Preserve, and the Kodiak Island Wildlife Refuge (DoN 2006).

National Marine Sanctuaries

The National Marine Sanctuary (NMS) system is administered by National Oceanic and Atmospheric Administration (NOAA) and protects special natural and cultural resources. There are 14 sites in the NMS program, creating a system that protects over 113,123 square nm (nm^2) (388,000 square km [km^2]) of U.S. ocean waters and habitats. Each NMS has an established management plan that guides the activities and sanctuary programs, sets priorities, and contains relevant regulations. There are no NMSs located within the boundaries of the TMAA.

Protected Habitats

Protected areas (Conservation Areas) throughout the GOA restrict groundfish harvest to minimize harmful impacts of fishing methodology and equipment to ocean bottom habitat (Figure 3.5-7). A widespread Atka mackerel closure established in 2002 under Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) extends from the coastline to the EEZ boundary (200 nm) throughout the GOA (DoN 2006). Fishing restrictions also reduce food resource competition by increasing Steller sea lion prey abundance (NMFS 1997). Protected areas are located around Steller sea lion haulout and rookery sites with coverage varying from 3 to 20 nm (5.6 to 37 km). Access, harvest, and fishing restrictions are modified for all 79 sites. Restriction enforcement and fishery management are controlled by NOAA, North Pacific Fishery Management Council (NPFMC), and United States Coast Guard (USCG).

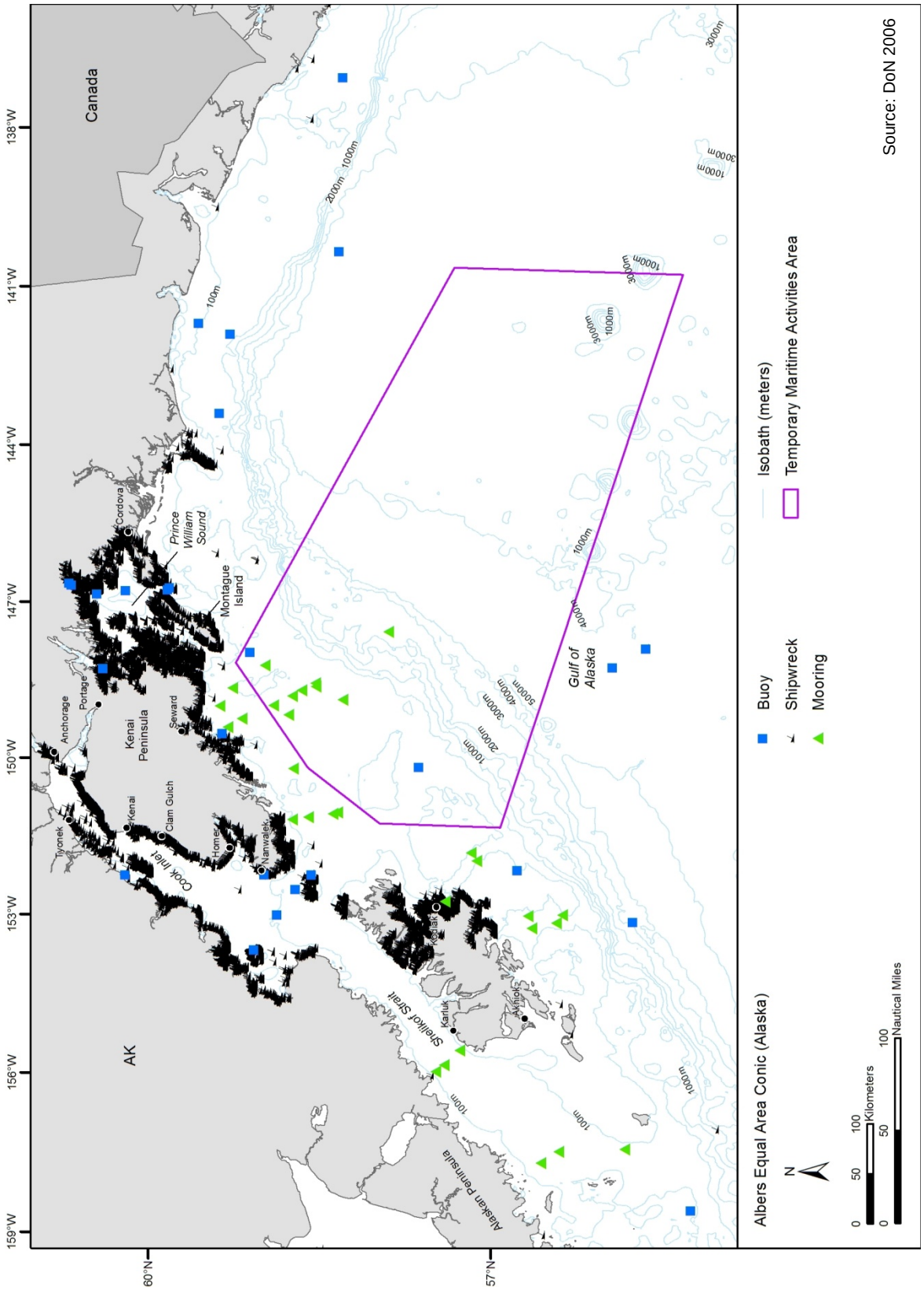


Figure 3.5-6: Artificial Habitat (e.g., buoys & moorings) within the TMAA & Surrounding Vicinity

Several habitat types identified as HAPCs (Habitat Areas of Particular Concern) focus on specific habitat locations, such as seamounts and hard coral areas (NPFMC 2005). Amendments to the Fishery Management Plan (FMP) for salmon fisheries in the EEZ off the coast of Alaska, the FMP for the scallop fishery off Alaska, and the FMP for groundfish of the GOA have established the following Habitat Conservation Areas and Habitat Protection Areas in the GOA: ten Gulf of Alaska Slope Habitat Conservation Areas (GOASHCAs), 15 Alaska Seamount Habitat Protection Areas (ASHPAs), and five Gulf of Alaska Coral Habitat Protection Areas (NMFS 2006). Within the TMAA, one GOASHCA (Cable) and three ASHPAs (Dall, Giacomini, and Quinn Seamounts) occur almost entirely within the TMAA (Figure 3.5-7). Other areas, such as the Kodiak Seamount and Middleton West GOASHCA, are partially located in the TMAA.

3.5.1.2 Current Requirements and Practices

The Navy has no existing protective measures in place specifically for marine plants and invertebrates. However, marine plants and invertebrates benefit from measures in place to protect marine mammals, sea turtles, and Essential Fish Habitat. For a complete description of these measures, see Chapter 5.

3.5.2 Environmental Consequences

As noted in Section 3.5.1, the ROI for consideration of impacts on marine plants and invertebrates is the GOA TMAA. Aircraft overflight and training activities are assumed to have no impacts to marine communities because impacts of sound on plants and invertebrates are unknown and difficult to quantify.

3.5.2.1 Regulatory Framework

Federal

Impacts to wetlands, estuarine mud flats, and marine vegetated shallows are regulated under Section 404 of the Clean Water Act (CWA; 33 U.S.C. 1251, et seq.) and Executive Order (EO) 11990, *Protection of Wetlands*. Dredge and fill activities are permitted by the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA). Other provisions of the CWA are intended to address water quality, such as excess nutrient that can affect the health of estuarine habitat like seagrass beds. The EO directs federal agencies to minimize wetland loss and degradation resulting from federal projects and land management activities.

Executive Order 13158 “Marine Protected Areas” was authorized in May 2000 to protect the significant natural and cultural resources within the marine environment for the benefit of present and future generations by strengthening and expanding the nation's system of MPAs. The purpose of the order was to, consistent with domestic and international law: (a) strengthen the management, protection, and conservation of existing marine protected areas and establish new or expanded MPAs; (b) develop a scientifically based, comprehensive national system of MPAs representing diverse U.S. marine ecosystems, and the nation's natural and cultural resources; and (c) avoid causing harm to MPAs through federally conducted, approved, or funded activities.

The United States claims jurisdiction over marine areas extending 200 nautical miles from its coast and has regulated resources in the zones composing this area under multiple legal authorities including federal, state, territorial, tribal, or local entities. Several current laws which might provide authority for the creation of MPAs are aimed specifically at the ocean environment; the National Marine Sanctuary Program, established by the Marine Protection, Research and Sanctuaries Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the Coastal Zone Management Act each specifically contemplate various levels and forms of aquatic resource protection.

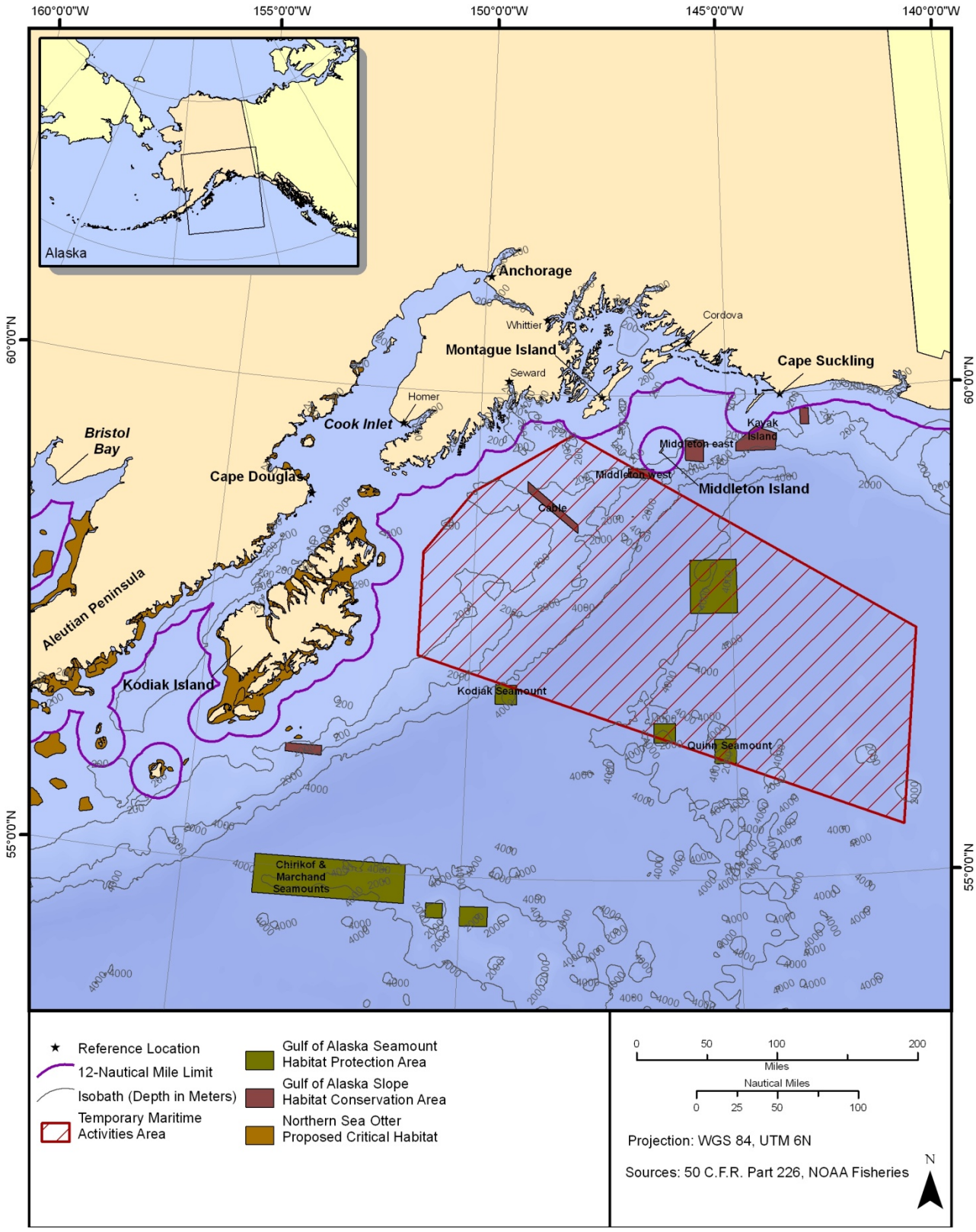


Figure 3.5-7: Conservation Areas in Vicinity of the TMAA

The federal Coastal Zone Management Act (CZMA; 16 U.S.C. 1451, et seq.) is a voluntary federal-state partnership that encourages states to adopt programs that meet federal goals of protecting and restoring coastal zone resources, including protecting coastal waters from nonpoint source pollution (16 U.S.C. 1455[b]). The program is administered by NOAA. The act requires participating coastal states to develop management programs that demonstrate how states will carry out their obligations and responsibilities in managing their coastal areas.

Upon federal approval of a state's coastal zone management program, the state benefits by becoming eligible for federal coastal zone grants and by gaining review authority over certain federal activities in the coastal zone and the consistency of those activities with the coastal zone management plan. CZMA specifically excludes federal lands from state designation. However, federal consistency requirements in the act (Section 307) require that federal activities be consistent with the management program to the "maximum extent practicable."

State and Local Governments

Alaska has several protected areas, such as state parks and significant biological areas, along its coast. However, ocean training activities under the Proposed Action would occur at least 20 nm (37 km) offshore. Therefore, the materials expended during training, and the explosions and impacts anticipated, will not affect these areas. More details regarding state programs related to CZMA may be found in Section 3.3, Water Resources.

3.5.2.2 Approach to Analysis

Data Sources

A systematic review of relevant literature and data was conducted to complete this analysis for marine plants and invertebrates in the GOA. Sources included journals, books, Internet sites, natural resource management plans, previous NEPA documents for facilities and activities in the GOA, Department of Defense (DoD) operations reports, and other technical reports published by government agencies, private businesses, and consulting firms. The literature and other information sources cited are identified in Chapter 8, References.

Assessment Methods

Potential stressors to marine communities in the TMAA that would result from changes in activities between the No Action Alternative and the other alternatives are limited to 1) direct impacts to bottom-dwelling communities from materials expended during training, or the accumulation of those materials; and 2) explosions on or below the sea surface. Impacts to pelagic and benthic marine communities could include localized disturbance of water column habitat, alteration or destruction of benthic habitat, or detrimental effects to federal and state species of concern or their habitats. Some of the metals and other materials used during training are hazardous, such as lead ballast and battery components. The impact of these materials on marine water and sediment quality is discussed in Sections 3.2 and 3.3, Expended Materials and Water Resources, respectively. Other potential stressors that are analyzed in Section 3.6, such as vessel movement or aircraft overflights that were determined not to affect marine plants or invertebrates, were removed from further analysis.

Materials Expended during Training

Impacts on marine communities that may arise from materials expended during training were evaluated based on the estimated amount under each alternative, the geographic dispersion of the proposed activities, the resulting density of the expended materials, and timing of and duration of training exercises.

Explosions

Alternatives were evaluated for long-term effects on marine communities that would result from explosions, based on their force, location, and proximity to the bottom. Short-term effects, including

increases in local turbidity, were not considered because they dissipate relatively quickly under the influence of ocean and tidal currents, wind-generated currents, and the natural sediment transport processes that operate continuously in the open ocean.

Ballast Water and Invasive Species

In 1990, Congress enacted the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (NANPCA; Title I of P.L. 101-646; 16 U.S.C. §§4701, et seq.), which established a federal program to prevent the introduction and to control the spread of unintentionally introduced aquatic nuisance species and gave the U.S Coast Guard jurisdiction over ballast water management. Thereafter, the U.S. Coast Guard published final rules on ballast water management for vessels entering the Great Lakes as well as the Hudson River and eventually made procedures mandatory for vessels entering those areas. The Coast Guard, along with U.S. Environmental Protection Agency (EPA), U.S. Fish and Wildlife Service (FWS), Army Corps of Engineers, and National Oceanic and Atmospheric Administration (NOAA) also share responsibilities for implementing this effort, acting cooperatively as members of an Aquatic Nuisance Species (ANS) Task Force to conduct studies and report to Congress to (1) identify areas where ballast water exchange can take place without causing environmental damage; and (2) determine the need for controls on vessels entering U.S. waters other than the Great Lakes.

In 1996, the National Invasive Species Act (NISA) amended NANPCA to create a national ballast management program modeled after the Great Lakes program wherein all ships entering U.S. waters (after operating outside the U.S. Exclusive Economic Zone) are directed to undertake high seas (i.e., mid-ocean) ballast exchange or alternative measures pre-approved by the Coast Guard as equally or more effective. In 2001, U.S. Coast Guard published a final rule that established regulations for ballast water management for Control of Nonindigenous species in waters of the United States (66 FR 58381). In 2004, the U.S. Coast Guard published a final rule making the ballast water management program mandatory requiring all vessels equipped with ballast water tanks and bound for ports or places of the United States to conduct a mid-ocean ballast water exchange, retain their ballast water onboard, or use an alternative environmentally sound ballast water management method approved by the Coast Guard. Additionally, the Coast Guard set penalties for failure to comply with reporting requirements under 33 CFR 151.

When NISA amended the NANPCA in 1996, 16 USC 4713 was added, which indicated that the Department of Defense was to establish its own "ballast water management program for seagoing vessels of the Department of Defense to minimize the risk of introduction of nonindigenous species from releases of ballast water." Additionally, the Clean Water Act was amended in 1996 to allow for the Secretary of the Defense and Administrator of the EPA to work in consultation with the U.S. Coast Guard and interested states to determine discharges incidental to the normal operation of a vessel of the Armed Forces for which it is reasonable and practicable to require use of a marine pollution control device. On May 10, 1999, EPA and DOD published the final rule establishing regulations for undertaking to establish the Uniform National Discharge Standards for Vessels of the Armed Forced. This rule completed the first phase of a three-phase process to set the Uniform National Discharge standards. This Phase I rule determined the type of vessel discharges that require control by MPCDs and those that do not, based on anticipated environmental effects of the discharge as well as factors listed in the Clean Water Act. A total of 25 vessel discharges that have the potential to cause an adverse impact on the environment requiring control standards have been identified under Phase I of the program (Federal Register 64[89], 25126-25138). Dirty ballast was one of the types of incidental discharges identified to require a marine pollution control device in Phase I. Phase II involves developing performance standards and control procedures for those discharges. The Navy and EPA have agreed to promulgate Phase II standards in batches. The batch rulemaking approach allows the Navy and EPA to conduct technical analyses and develop discharge standards in batches (approximately five discharges per batch) rather than conducting analyses and developing standards for all 25 discharges at one time. To date, this Phase II process is still ongoing.

Therefore, since Navy ships operate worldwide, the Navy has chosen to adopt the intent of the Coast Guard standards with respect to ballast water management even though U.S. Coast Guard regulations exempt vessels of the Armed Forces that are subject to the Uniform National Discharge Standards from the ballast water guidelines. Under Navy policy, if it is necessary for a surface ship to load ballast water in an area that is either potentially polluted or within 3 nm from the shore, the ship will pump the ballast water out when outside 12 nm from shore and twice fill the tank(s) with clean sea water and pump prior to the next entry within 12 nm from shore. It is also Navy policy to not exchange ballast water during local operations (within the same locale) or when returning within 12 nm in the same locale as the ballast water was initially loaded. Surface ships maintain records of all ballast water exchanges. To further reduce potential for entry of non-indigenous species, surface ships routinely wash down anchors, chains and appendages to prevent on board collection of sediment, mud and silt. Where possible following anchor retrieval, surface ships wash down chain lockers outside 12 nm from land to flush out sediment, mud or silt.

Invertebrate Hearing Overview

Very little is known about sound detection and use of sound by invertebrates (see Budelmann 1992a, b, Popper et al. 2001 for reviews). The limited data shows that some crabs are able to detect sound, and there has been the suggestion that some other groups of invertebrates are also able to detect sounds. In addition, cephalopods (octopus and squid) and decapods (lobster, shrimp, and crab) are thought to sense low-frequency sound (Budelmann 1992b). Packard et al. (1990) reported sensitivity to sound vibrations between 1 and 100 hertz (Hz) for three species of cephalopods. Lovell et al. (2005) concluded that at least one species from the invertebrate subphylum of crustacean (*Palaemon serratus*), is sensitive to the motion of water particles displaced by low-frequency sounds ranging from 100 Hz up to 3000 Hz. Wilson et al. (2007) documents a lack of physical or behavioral response for squid exposed to experiments using high-intensity sounds designed to mimic killer whale echolocation signals. In contrast, McCauley et al. (2000) reported that caged squid would show behavioral responses when exposed to sounds from a seismic airgun.

There has also been the suggestion that invertebrates do not detect pressure since few, if any, have air cavities that would function like the fish swim bladder in responding to pressure. It is important to note that some invertebrates, and particularly cephalopods, have specialized end organs, called statocysts, for determination of body and head motions that are similar in many ways to the otolithic end organs of fish. The similarity includes these invertebrates having sensory cells which have some morphological and physiological similarities to the vertebrate sensory hair cell, and the "hairs" from the invertebrate sensory cells are in contact with a structure that may bear some resemblance to vertebrate otolithic material (reviewed in Budelmann 1992a, b). As a consequence of having statocysts, it is possible that these species could be sensitive to particle displacement (Popper et al. 2001).

It is also important to note that invertebrates may have other organs that potentially detect the particle motion of sound, the best known of which are special water motion receptors known as chordotonal organs (e.g., Budelmann 1992a). These organs facilitate the detection of potential predators and prey and provide environmental information such as the movement of tides and currents. Indeed, fiddler crab (*Uca* sp.) and spiny lobster (*Panulirus* sp.) have both been shown to use chordotonal organs to respond to nearby predators and prey.

Like fish, some invertebrate species produce sound, with the possibility that it is used for communication. Sound is used in territorial behavior, to deter predators, to find a mate, and to pursue courtship (Popper et al. 2001). Well-known sound producers include lobsters (*Panulirus* sp.) (Latha et al. 2005) and snapping shrimp (*Alpheus heterochaelis*) (Heberholz and Schmitz 2001). Of all marine invertebrates, perhaps the one best known to produce sound is the snapping shrimp (Heberholz and Schmitz 2001). Snapping shrimp are found in oceans all over the world and make up a significant portion of the ambient noise budget in many locales (Au and Banks 1998).

Effects of Sound on Invertebrates

McCauley et al. (2000) found evidence that squid exposed to seismic airguns show a behavioral response including inking. However, these were caged animals, and it is not clear how unconfined animals may have responded to the same signal and at the same distances used. In another study, Wilson et al. (2007) played back echolocation clicks of killer whales to two groups of squid (*Loligo pealeii*) in a tank. The investigators observed no apparent behavioral effects or any acoustic debilitation from playback of signals up to 199 to 226 dB re 1 micro-Pascal (μPa).

In another report on squid, Guerra et al. (2004) claimed that dead giant squid turned up around the time of seismic airgun operations off of Spain. The authors suggested, based on analysis of carcasses, that the damage to the squid was unusual when compared to other dead squid found at other times. However, the report presents conclusions based on a correlation to the time of finding of the carcasses and seismic testing, but the evidence in support of an effect of airgun activity was totally circumstantial. Moreover, the data presented showing damage to tissue is highly questionable since there was no way to differentiate between damage due to some external cause (e.g., the seismic airgun) and normal tissue degradation that takes place after death, or due to poor fixation and preparation of tissue. To date, this work has not been published in peer-reviewed literature, and detailed images of the reportedly damaged tissue are also not available.

There has been a recent and unpublished study in Canada that examined the effects of seismic airguns on snow crabs (DFO 2004). However, the results of the study were not at all definitive, and it is not clear whether there was an effect on physiology and reproduction of the animals.

There is also some evidence that an increased background noise (for up to 3 months) may affect at least some invertebrate species. Lagardère (1982) demonstrated that sand shrimp (*Crangon crangon*) exposed in a sound-proof room to noise that was about 30 dB above ambient for 3 months demonstrated decreases in both growth rate and reproductive rate. In addition, Lagardère and Régnault (1980) showed changes in the physiology of the same species with increased noise, and that these changes continued for up to a month following the termination of the signal.

Finally, there was a recently published statistical analysis that attempted to correlate catch rate of rock lobster in Australia over a period of many years with seismic airgun activity (Parry and Gason 2006). The results, while not examining any aspects of rock lobster behavior or doing any experimental study, suggested that there was no effect on catch rate from seismic activity.

3.5.2.3 No Action Alternative

Activities under the No Action Alternative that may affect marine communities include materials expended during training as well as explosions and impacts. This analysis reviews the circumstances under which those expended materials and explosions may harm or substantially degrade the pelagic marine communities or benthic communities in the TMAA.

Expended Materials

Materials expended during training include sonobuoys; parachutes and nylon cord; some towed, stationary, and remote-controlled targets; inert munitions; and exploded and unexploded munitions, including missiles, bombs, and shells. These materials arise from 1) missiles and bombs used during Missile Exercises (MISSILEX) and Bombing Exercises (BOMBEX), respectively; and 2) shells fired during Gunnery Exercises (GUNEX) and BOMBEX. BOMBEX mostly involves the use of inert training munitions, but explosives are occasionally used.

Materials from these sources include a variety of plastics, metals, and batteries. Unless otherwise noted in the discussion or the table, targets are not recovered. Most of these materials are inert and dense, and will settle deep in bottom sediments, become covered by sediments, or encrusted by physical or biological

processes. However, some of the metals and other materials such as lead, lithium, and batteries, are hazardous.

Additional materials expended during training include illuminating flares, marine markers, and chaff. These materials were dismissed from further analysis because, for both canisters and markers, the majority of the constituents are consumed by heat and smoke, both of which dissipate in the air. Any remaining materials from marine markers would sink into bottom sediments or become encrusted by chemical processes or by marine animals. Phosphorus contained in the markers reacts with seawater to produce phosphoric acid, a variable, but normal, component of seawater. Chaff consists of aluminum-coated polymer fibers inside of a launching mechanism, and are widely dispersed on deployment. Chaff settling on the ocean surface may temporarily raise turbidity, but will quickly disperse with particles eventually settling to the ocean floor.

The impact of these materials on marine water and sediment quality is discussed in Sections 3.2 and 3.3, Expended Materials and Water Resources, respectively.

Open Ocean Habitats

The effect of materials expended during training in the TMAA is assessed by the number of expended items per unit area. Under the No Action Alternative, an estimated 15,982 items would be expended in this area (Table 3.5-1). Based on a TMAA size of 42,146 nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, 1.9 items per nm^2 (0.5 per km^2) per year would be deposited in the ocean. More than 97 percent of these items would be from gunshells and small caliber rounds.

Table 3.5-1: Expended Training Materials in the TMAA – All Alternatives

Training Material	No Action Alternative	Alternative 1		Alternative 2	
	Number	Number	% Increase from No Action	Number	% Increase from No Action
Bombs	120	180	50%	360	200%
Missiles	22	33	50%	66	200%
Targets and Pyrotechnics	252	322	28%	644	160%
Naval Gunshells	10,564	13,188	25%	26,376	150%
Small Caliber Rounds	5,000	5,700	14%	11,400	130%
Sonobuoys	24	793	3,200%	1,587	6,500%
PUTR	0	7	NA	7	NA
SINKEX	0	0	NA	858	NA
Total	**15,982**	**20,223**	**26%**	**41,298**	**160%**

Notes: Numbers of training items are estimates.

Pelagic Communities

Pelagic species, whether plankton or large invertebrates, are most common in the surface and near-surface layers of the open ocean. Therefore, any expended materials have the potential to kill or harm individual animals and plants in the immediate vicinity. In situations where expended materials are deposited in an area with a high concentration of individuals, the extent of death or harm would be greater than in a more barren area. However, pelagic species are abundant, have high rates of reproduction, are widely distributed, both across the ocean surface and vertically in the water column, and their distribution tends to be patchy rather than uniform. Because of these factors and the very low density of expended materials that would be associated with the No Action Alternative, negligible impacts are anticipated.

Deepwater Benthic Habitats

The shelf of the TMAA is a complex and dynamic geologic environment characterized by banks, patchy rocky substrate, and patchy bottom sediments (DoN 2006). Banks are exposed to both wave and current action (particularly during winter storms) that continually resuspend bottom sediments. Bottom material such as sand, gravel, boulders, and broken shells are most characteristic of the banks while finer sediment accumulates in the depressions and the troughs of the region. The bottom substrate of the continental slope is typically covered with silts, clays, and fine sediments; however, there is the occasional hard bottom substratum (e.g., rocky outcroppings, rubble, talus, vertical wall, and seamounts) that supports a diverse assemblage of deep-sea invertebrates and fishes.

Most expended materials are inert and dense and readily sink deep into existing sediments or become covered with sediment over time. These materials would also become encrusted by chemical processes or by marine organisms that further isolates them from the environment. Once deposited, the materials would not pose a hazard to benthic communities. Because high quality habitat occupies only a small portion of the benthic environment, there is a small potential for the communities to be affected by initial impact of expended materials. However, injury or death could occur to bottom-dwelling organisms if struck.

The deposition of training materials on the ocean bottom under the No Action Alternative is judged to have negligible impacts because 1) expended materials are distributed widely enough that less than two items would be deposited on the bottom per nm^2; and 2) the majority of those items are small caliber rounds that would have little impact. However, if sensitive habitats were struck by larger objects, localized impacts could occur. These communities usually have slow rates of recovery; however, over the long term, such objects could also provide new, hard substrate for benthic communities to utilize.

Explosions

Under the No Action Alternative, activities involving explosive munitions occur at or just below the surface in the TMAA. These include sea surface explosions from missiles and bombs used during BOMBEX and SINKEX; and shells fired during GUNEX and BOMBEX. Additional subsurface explosions involve the use of explosive sonobuoys used during Tracking Exercises (TRACKEX).

Open Ocean Habitats

The effect of explosions in the TMAA is based on the number and force of explosive munitions in proximity to pelagic and deepwater benthic habitats. Under the No Action Alternative an estimated 88 explosive munitions would be used in the open ocean of the TMAA (Table 3.5-2). Based on a TMAA size of 42,146 nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, 0.01 explosions would occur per nm^2 (0.003 per km^2) per year.

Pelagic Communities

Pelagic species, whether plankton or large invertebrates, are most common in the surface and near-surface layers of the open ocean. Therefore, any surface or near-surface explosions or impacts have the potential to kill or harm individual animals and plants in the immediate vicinity. However, the shock waves from such explosions attenuate quickly (within a period of milliseconds). In situations where an explosion or impact occurred in an area with a high concentration of individuals, the extent of death or harm would be greater than in a more barren area.

Table 3.5-2: Explosive Munitions Used in the TMAA – All Alternatives

Training Material	No Action Alternative	Alternative 1		Alternative 2	
	Number	Number	% Increase from No Action	Number	% Increase from No Action
Bombs	48	72	50%	166	246%
Naval Gunshells (5-inch / 76 mm)	40	56	40%	112	180%
IEER Sonobuoys	0	40	NA	80	NA
SINKEX	0	0	NA	858	NA
Total	**88**	**168**	**91%**	**1,194**	**1,257%**

Notes: Numbers of training items are estimates.

However, pelagic species are abundant, have high rates of reproduction, are widely distributed, both across the ocean surface and vertically in the water column, and their distribution tends to be patchy rather than uniform. Because of these factors and the very low density of explosions that would be associated with the No Action Alternative, negligible impacts are anticipated.

Deepwater Benthic Habitats

All of the explosions listed in Table 3.5-2 would occur at or near the surface of waters that generally exceed 1,650 ft in depth (500 m) over the continental shelf, and several thousand feet deep over the slope and abyssal plain. In such settings, the shock waves from explosions and impacts at or near the surface would largely attenuate well before reaching bottom-dwelling habitats. Thus, adverse impacts are not considered likely under the No Action Alternative.

3.5.2.4 Alternative 1

Alternative 1 is a proposal designed to meet Navy and DoD current and near-term operational training requirements. If Alternative 1 were to be selected, in addition to training activities currently conducted, the ATA would support an increase in training activities to include conducting ASW activities and the use of MFA sonar during ASW activities, as well as increases in training activities due to force structure changes associated with the introduction of new weapon systems, vessels, aircraft, and training instrumentation into the Fleet. Under Alternative 1, baseline-training activities would be increased for some activities. In addition, training activities associated with force structure changes would be implemented for the EA-18G Growler, Guided Missile Submarine (SSGN), P-8 Multimission Maritime Aircraft (MMA), Guided Missile Destroyer [DDG] 1000 [Zumwalt Class] destroyer, and unmanned aerial systems (UASs). Force structure changes associated with new weapons systems would include new sonobuoys. Force structure changes associated with new training instrumentation include the Portable Undersea Training Range (PUTR).

Activities under Alternative 1 that may affect marine communities include materials expended during training as well as explosions and impacts. This analysis reviews the circumstances under which those expended materials and explosions may harm or substantially degrade the pelagic marine communities or benthic communities in the TMAA.

Materials Expended during Training

Open Ocean Habitats

Under Alternative 1, an estimated 20,223 items would be expended in the open ocean of the TMAA, a 26 percent increase over the No Action Alternative (see Table 3.5-1). Based on an open ocean area of 42,146

nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, 2.4 items per nm^2 (0.7 per km^2) per year would be deposited in the ocean. More than 93 percent of these items would be from gunshells and small caliber rounds**.**

Pelagic Communities

Pelagic species are abundant, have high rates of reproduction and are widely distributed, both across the ocean surface and vertically in the water column. Because of these factors and the low density of materials expended during training, Alternative 1 would have negligible impacts on pelagic communities.

Deepwater Benthic Habitats

Similar to the No Action Alternative, the deposition of training materials on the ocean bottom under Alternative 1 is judged to have negligible impacts because 1) using conservative estimates (assumed that activities would occur in the only 20% of the TMAA instead of the using the entire TMAA; therefore, greater concentration) expended materials are distributed widely enough that less than three items would be deposited on the bottom per nm^2; and 2) the majority of those items are small caliber rounds that would have little impact. However, if sensitive habitats were struck by larger objects, localized impacts could occur. These communities usually have slow rates of recovery; however, over the long term, such objects could also provide new, hard substrate for benthic communities to utilize.

Explosions

Open Ocean Habitats

As shown in Table 3.5-2, an estimated 168 explosions would occur in the TMAA under Alternative 1, an increase of 91 percent over the No Action Alternative. Based on an open ocean area of 42,146 nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, there would be about 0.02 explosions per nm^2 (0.006 per km^2) per year.

Pelagic Communities

Based on the abundance and wide-spread distribution of pelagic species, the effects of explosions under Alternative 1 would be negligible.

Deepwater Benthic Habitats

Because all explosions in the open ocean would occur at or near the surface, the impacts to deepwater benthic habitats under Alternative 1 would be negligible.

Portable Undersea Tracking Range

The PUTR is a self-contained, portable, undersea tracking capability that employs modern technologies to support coordinated undersea warfare training for Forward Deployed Naval Forces (FDNF). PUTR will be available in two variants to support both shallow and deep water remote activities in keeping with Navy requirements to exercise and evaluate weapons systems and crews in the environments that replicate the potential combat area. The system will be capable of tracking submarines, surface ships, weapons, targets, and Unmanned Underwater Vehicles (UUVs) and distribute the data to a data processing and display system, either aboard ship, or at a shore site.

No area supporting a PUTR system has been identified; however, potential impacts to marine habitats that support plants and invertebrates can be assessed based on several assumptions. Assuming that transponders are deployed on soft-bottom habitats, impacts would be similar to those discussed for expended materials. There would be direct impact to soft bottom habitat where the clump weight contacted the bottom, which may result in localized mortality to epifauna and infauna within the footprint, although it is anticipated that recolonization would occur within a relatively short period of time. Upon

completion of the exercise, the transponders, which have an acoustic link, are sent a signal that breaks the link and the transponders float to the surface for recovery. This design feature eliminates any potential impacts associated with hazardous materials such as batteries and electronic components. The clump weights are not recovered, and since they are composed of inert material, they are not a potential source of contaminants, and could provide a substrate for benthic fauna. There may also be indirect effects associated with increased turbidity due to resuspension of sediments from the clump weights contacting the bottom. The turbidity plume is expected to be localized and temporary, as sediment would eventually settle to the ocean floor or be dispersed by ocean currents. Therefore, localized and temporary impacts to benthic fauna may occur from the PUTR, but no long-term impact is anticipated.

3.5.2.5 Alternative 2

Implementation of Alternative 2 would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional separate summertime CSG exercise lasting up to 21 days within the ATA.
- Conduct a SINKEX in each summertime exercise (a maximum of two) in the TMAA.

Activities under Alternative 2 that may affect marine communities include materials expended during training as well as explosions. This analysis reviews the circumstances under which those expended materials and explosions may harm or substantially degrade the pelagic marine communities or benthic communities in the TMAA.

Materials Expended During Training

Open Ocean Habitats

Under Alternative 2, an estimated 41,298 items would be expended in the TMAA, an increase of 160 percent over the No Action Alternative (see Table 3.5-1). Based on an open ocean area of 42,146 nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, 4.9 items per nm^2 (1.4 per km^2) per year would be deposited in the ocean. More than 91 percent of these items would be from gunshells and small caliber rounds.

Pelagic Communities

Pelagic species are abundant, have high rates of reproduction, and are widely distributed, both across the ocean surface and vertically in the water column. Because of these factors and the low density of materials expended during training, negligible impacts are anticipated under Alternative 2 (same as the No Action Alternative).

Deepwater Benthic Habitats

Similar to the No Action Alternative, the deposition of training materials on the ocean bottom under the Alternative 2 is judged to have negligible impacts because 1) using conservative estimates expended materials are distributed widely enough that less than five items would be deposited on the bottom per nm^2; and 2) the majority of those items are small caliber rounds that would have little impact. However, if sensitive habitats were struck by larger objects, localized impacts could occur. These communities usually have slow rates of recovery; however, over the long term, such objects could also provide new, hard substrate for benthic communities to utilize.

Explosions

Open Ocean Habitats

Under Alternative 2, an estimated 1,194 explosions would occur in the open ocean of the TMAA, an increase of 1,257 percent over the No Action Alternative (see Table 3.5-2). Based on an open ocean area of 42,146 nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, there would be 0.14 explosions per nm^2 (0.04 km^2) per year.

Pelagic Communities

Based on the abundance and wide-spread distribution of pelagic species, the effects of explosions under Alternative 2 would be negligible.

Deepwater Benthic Habitats

Because all explosions in the open ocean of the TMAA would occur at or near the surface, the impacts to deepwater benthic habitats under Alternative 2 would be negligible.

Portable Undersea Tracking Range

Under Alternative 2, impacts from the PUTR would be the same as those described for Alternative 1, with localized and temporary impacts to benthic fauna, but no long-term impacts are anticipated.

SINKEX

A SINKEX is conducted under the auspices of an overarching permit from the USEPA (40 CFR § 229.2, Transport of Target Vessels, and the August 1999 Navy/USEPA agreement that details vessel preparation requirements to address PCBs under the SINKEX permit). Operations involve the use of missiles, bombs, and torpedoes, which contain missile propellants, fuel, engine oil, hydraulic fluid, and batteries, all of which may affect marine water quality and biota. The detailed analysis of Sections 3.2 (Expended Materials) and 3.3 (Water Resources) indicates that the concentration of potential contaminants associated with bombs, missiles, and torpedoes is below criteria established for the protection of aquatic life. Although localized and temporary impacts to the pelagic environment would occur, the relatively small quantities of materials expended, dispersed as they are over a very large area, would have no adverse physical effects on marine biological resources. In addition, SINKEX operations occur in the open ocean (at least 1,000 fathoms [6,000 ft] deep) and in avoidance of HAPCs. However, the sunken vessel may alter soft-bottom habitats, but may provide a beneficial use by providing habitat in the deep water environment. Given these reasons, impacts to open ocean habitats from SINKEX are negligible.

3.5.3 Mitigation

As summarized in Section 3.5.2, the actions proposed under the alternatives described in this EIS/OEIS would have minimal impacts on the marine plant and invertebrate communities of the TMAA. Therefore, no resource-specific mitigation measures would be required. See Chapter 5 for additional discussion of mitigation measures.

3.5.4 Summary of Effects

The Proposed Action alternatives would have minimal impacts on marine plant or invertebrate resources in the TMAA. These effects would be related to ordnance use and expended materials, and would not be anticipated to be measurable (detectable), given the large area over which activities occur and the dynamic nature of the marine environment of the TMAA. Table 3.5-3 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on marine plants and invertebrates under both the National Environmental Policy Act (NEPA) and EO 12114.

Table 3.5-3: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Overflights would not affect marine plants and invertebrates.	• Expended materials and the release of munitions constituents and other materials would be distributed across 20 percent of the TMAA (1.9 items per nm^2 [0.5 per km^2]) and have minimal effects on pelagic and benthic communities. More than 97 percent of these items would be from gunshells and small caliber rounds. • Surface or near-surface explosions have the potential to kill or harm individual animals and plants in the immediate vicinity resulting in localized impacts. Given the TMAA size and using conservative estimates, 0.01 explosions would occur per nm^2 (0.003 per km^2) per year resulting in minimal effects. Benthic communities would not be affected by explosions due to water depth.
Alternative 1	• Overflights would not affect marine plants and invertebrates.	• Expended materials and the release of munitions constituents and other materials would be distributed across 20 percent of the TMAA (2.4 items per nm^2 [0.7 per km^2]) and have minimal effects on pelagic and benthic communities. More than 93 percent of these items would be from gunshells and small caliber rounds. • Surface or near-surface explosions have the potential to kill or harm individual animals and plants in the immediate vicinity resulting in localized impacts. Given the TMAA size and using conservative estimates, 0.02 explosions would occur per nm^2 (0.006 per km^2) per year resulting in minimal effects. Benthic communities would not be affected by explosions due to water depth. • Localized and temporary impacts to benthic fauna may occur from the PUTR, but no long-term impact is anticipated.

Table 3.5-3: Summary of Effects by Alternative (continued)

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 2 (Preferred Alternative)	• Overflights would not affect marine plants and invertebrates.	• Expended materials and the release of munitions constituents and other materials would be distributed across 20 percent of the TMAA (4.9 items per nm^2 [1.4 per km^2]) and have minimal effects on pelagic and benthic communities. More than 91 percent of these items would be from gunshells and small caliber rounds. • Surface or near-surface explosions have the potential to kill or harm individual animals and plants in the immediate vicinity resulting in localized impacts. Given the TMAA size and using conservative estimates, 0.14 explosions would occur per nm^2 (0.04 per km^2) per year resulting in minimal effects. Benthic communities would not be affected by explosions due to water depth. • Localized and temporary impacts to benthic fauna may occur from the PUTR, but no long-term impact is anticipated. • Although localized and temporary impacts to the pelagic environment would occur from a SINKEX, the relatively small quantities of materials expended, dispersed as they are over a very large area, would have no adverse effect on marine biological resources.

Note: Quantitative estimates conservatively assumed that activities occurred across 20 percent of the TMAA.

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3.6 Fish

3.6 FISH

3.6.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for fish is the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). The TMAA is more than 12 nautical miles (nm) (22 kilometers [km]) from the closest point of land and is therefore outside of United States (U.S.) territorial seas. Thus, this section provides an overview of the species, distribution, and occurrence of fishes that are either resident or migratory through the GOA TMAA. A brief discussion of Essential Fish Habitat (EFH) is provided in Section 3.6.1.2 of this EIS/OEIS and a brief discussion of federally listed threatened and endangered fish species protected under the Endangered Species Act (ESA) in the TMAA is provided in Section 3.6.1.3.

In the GOA, the majority of the fishery resources are found along the broad continental shelf ecosystem (Richardson and Erickson 2005). Important marine species include salmonids (Chinook, coho, chum, pink and sockeye salmon, and steelhead), Pacific halibut, shelf and slope groundfish (walleye pollock, Pacific, sablefish, rockfishes, rex sole, Dover sole, arrowtooth flounder), dungeness crab, and scallops (U.S. Department of Commerce, National Oceanic and Atmospheric Administration [USDC, NOAA] 2005; Richardson and Erickson 2005). The Pacific high seas salmon are arguably the most important living marine resource within the GOA. Currently the GOA supports habitats of "endangered" and "threatened" populations of high seas salmon (Chinook, coho, chum, and sockeye salmon, and steelhead) (Section 3.6.1.3) (NMFS 2005b, 2005c).

The TMAA falls within the Alaska Current (AC) and the Alaska Coastal Current (ACC) systems. Both currents flow in a northerly direction off southeastern Alaska and then turn southwestward along the Alaska coast. Beyond Kodiak Island, the AC intensifies and becomes the Alaskan Stream as it flows along Alaskan Peninsula and the Aleutian Archipelago (Reed and Schumacher 1986). The AC system is rich in microscopic organisms (i.e., large-celled diatoms, small cyanobacteria, microflagellates, micro-/meso-zooplankton) which form the base of the food chain in the GOA. Grazers like forage species and small pelagic fish depend on this planktonic food supply, and in turn are forage for larger species, such as highly migratory species (e.g., high seas salmon) (Parsons 1986).

The TMAA and vicinity is a highly productive region for various marine fish and shellfish populations and supports some of the most productive fisheries in the United States. (Lanksbury et al. 2005). It is also an important spawning area for many fishes, supporting a diverse array of larval fish species influenced by bathymetric features (i.e., shelf, slope, etc.) in the spring and bathymetry/circulation features in the autumn (Doyle et al. 2002, Matarese et al. 2003, Doyle et al. 2005, Lanksbury et al. 2005). At least 383 species belonging to 84 families of marine and anadromous fishes have been reported from the predominant ecosystems found in the GOA TMAA: nearshore, continental shelf/slope, and offshore areas (Mecklenburg et al. 2002). Bony fishes (e.g., sculpins, snailfish, rockfish, and flatfish) dominate the number of species in the GOA with less than 10 percent of species being cartilaginous fishes (e.g., sharks, skates) (Mundy and Hollowed 2005). Shellfish (arthropods [e.g., crabs/shrimps] and mollusks (e.g., scallops, squids, and octopuses]) along with other benthic invertebrates comprise the bottom assemblage on the shelf/slope and nearshore areas in number of species and biomass (Feder and Jewett 1986; Outer Continental Shelf Environmental Assessment program [OCSEAP] 1986).

The fish fauna of the GOA consists of a mix of temperate and subarctic species, resulting in a large gradient in species composition along the shelf from the eastern to the western GOA (Hart 1973). Nearshore areas (e.g., Kodiak Island, lower Cook Inlet, and Prince William Sound) consisting of habitats such as rocky/kelp, epipelagic, intertidal beaches, subtidal shelves, and deeper bottom of bays serve as important spawning and nursery grounds for juveniles of numerous demersal and pelagic species (Rogers 1986, Rogers et al. 1986). These species include high seas salmon, walleye pollock, Pacific cod, crab,

flatfish, and various forage species (Mueter 2004). The life history of many of these species is closely tied to the cyclonic boundary currents (e.g., subarctic), which transport eggs and larvae, and serve as important migratory pathways for juvenile salmon (Beamish et al. 2005).

Offshore areas are dominated by large epipelagic species that are capable of moving independently of currents (i.e., nekton), such as high seas salmon throughout the year with Pacific pomfret (*Brama japonica*), Pacific saury (*Cololabis saira*), and albacore tuna being common in the summer. These offshore areas in the GOA provide the principal feeding habitat for many species, particularly high seas salmon (Brodeur et al. 1999). All of these various species display a strong latitudinal gradient with their distribution correlating with sea surface temperature (Mueter 2004).

3.6.1.1 Existing Conditions

The following discussion provides an overview of the predominant fish species and habitat types known to occur in the TMAA. Two fish categories are described: salmonids and groundfish. As discussed in Section 3.5, Marine Plants and Invertebrates, the TMAA is over 12 nm (22.2 km) offshore and includes primarily offshore open ocean habitats including pelagic, continental shelf, slope, and abyssal plain regions, which are influenced by both the ACC and the Alaska Gyre.

Salmonids

There are six dominant species of salmon that occur in the GOA and have the potential of occurring in the TMAA: Chinook (*O. tshawytscha*), coho (*O. kisutch*), chum (*O. keta*), pink (*O. gorbuscha*), sockeye (*O. nerka*), and steelhead (*O. mykiss*). Salmonids found in the GOA are anadromous fish species that spend at least part of their adult life in the ocean but return to freshwater environments to spawn.

Pacific salmon (genus *Oncorhynchus*) range from San Francisco Bay, California, northward around the Pacific Rim through Alaska and southward along the coasts of Russia, Japan, and Korea (Myers et al. 1998). There are seven species of Pacific salmon; two species, masu (*Oncorhynchus masou*) and amago (*O. rhodurus*) only occur in Asia, and five species, Chinook, coho, chum, pink, and sockeye reproduce in North America and Asia (Groot and Margolis 1991; DFO 2002; USDC, NOAA 2005).

Until 1988, steelhead (the anadromous form of rainbow trout) was classified in the genus *Salmo* along with Atlantic salmon, brown trout, and several western trout species. With additional osteology and biochemistry data, biologists have now reclassified steelhead as members of the genus *Oncorhynchus*. The reason for this is that new information suggested that steelhead are more closely related to Pacific salmon than to brown trout and Atlantic salmon. As such, the American Fisheries Society - American Society of Ichthyologists Committee on Names of Fishes voted unanimously to accept *Oncorhynchus* as the proper generic name. For full scientific details, see Smith and Stearley 1989. As such, the scientific name of steelhead was changed from *Salmo gairdneri* to *Oncorhynchus mykiss*.

In general, the life history of Pacific salmon and steelhead includes incubation, hatching and emergence in freshwater, migration to the ocean, and subsequent initiation of maturation and return to freshwater for completion of maturation and spawning (Eggers 2004). Salmon are anadromous, meaning that they migrate up rivers and streams from the sea to spawn in freshwater. Pacific salmon spawn in gravel beds in rivers, streams and along lake-shores where females lay their eggs in nests or "redd" (Groot and Margolis 1991, Eggers 2004). Depending on the species, they spend between 1 to 7 years at sea, with most making extensive and complicated migrations (Quinn 2005). Generally, Pacific salmon return to their natal rivers to spawn and, with few exceptions, die soon after (Quinn 2005). The death of these salmon returns much-needed nutrients from the ocean to the otherwise nutrient-poor streams (Groot and Margolis 1991). Anadromy and the strong fidelity of homing to their natal streams have resulted in the development of many reproductively isolated subpopulations (little inbreeding occurs between salmon from one river and

another) referred to as stocks (Quinn 2005). These subpopulations are exposed to different physical and biotic factors such as temperature, flow, gravel size, predators, prey, competitors, and pathogens (Quinn 2005). These variations between streams have led to the evolution of specializations to help the salmon survive in their home rivers (PFMC 2000). These distinct habitat dynamics require these subpopulations be managed individually rather than as one homogenous species (Duffy et al. 2005).

Groundfish Species

Groundfish species (i.e., flatfish, rockfish, roundfish, skates, sharks and chimeras) support important commercial and recreational fisheries. A brief summary of the fisheries management is provided below. Many species of groundfish have EFH in the TMAA, and are discussed in more detail in Section 3.6.1.2

Groundfish range throughout the EEZ and occupy diverse habitats at all stages in their life histories. Some species are broadly dispersed during specific life stages, especially those with pelagic eggs and larvae. The distribution of other species and/or life stages may be relatively limited, as with adults of many nearshore rockfish which show strong affinities to a particular location or substrate type.

The continental shelf/slope supports a large biomass of groundfishes, particularly the wide shelf and banks around Kodiak Island, northwest of the GOA TMAA (Mueter 2004). Typically, the groundfish community in the GOA exhibits strong-depth gradient in species composition and diversity (Mueter and Norcross 2002) found in many other demersal fish communities inhabiting shelf and upper slope regions (Colvocoresses and Musick 1984, Jay 1996, Mahon et al. 1998). Information is lacking about demersal species on the deeper parts of the slope, continental rise, in the deep central basin, and on the numerous seamounts (Mueter 2004). Faunal assemblages collected from GOA seamounts, south of the TMAA, were dominated by giant (*Albatrossia pectoralis*) and Pacific (*Coryphaenoides acrolepis*) grenadiers, rockfish (*Sebastes* spp. and *Sebastolobus* sp.), and sablefish (Hoff and Stevens 2005) and may be representative of other seamounts in the GOA (Maloney 2004, Morato and Pauly 2004).

Flatfish are represented by halibut, flounders, soles, turbots, and plaice (Mecklenburg et al. 2002). Flatfish are demersal, meaning they live on the seafloor. Most marine flatfishes have planktonic egg and larval stages and they drift with currents for periods of weeks to months; therefore, larvae depend on features of currents to either retain them or transport them to suitable nursery areas. Most species change their diet from zooplankton to benthic animals as they settle on the bottom. Flatfishes often have highly specific habitat requirements for their juvenile and adult stages (Gibson 1994). In regions characterized by a landscape of suitable habitat, fragmented by barriers of unsuitable habitat such as deep sea valleys and canyons, colonization and recruitment are likely to depend on larval drift rather than movement of juveniles or adults across such barriers (Bailey et al. 2003). In the GOA, the landscape of suitable juvenile habitat is fragmented by troughs, sea valleys, and rocky areas. Delivery of larvae into suitable nursery areas is unpredictable due to the highly variable Alaska Coastal Current. In general, flatfish do not exhibit large-scale migration, but most of them move to shallower waters in spring and return to deeper waters in autumn.

Halibut exhibit similar life history traits. Previous research suggests that important settlement and nursery grounds for the eastern Pacific halibut population are located primarily in shallow coastal waters, extending from Dixon Entrance in British Columbia to the Bristol Bay region of the southeastern Bering Sea. Following approximately two years of residence on the nursery grounds, juveniles are believed to migrate in a southeasterly direction, arriving on the fishing grounds as four- or five-year-olds. Present day halibut fisheries harvest fish throughout the continental shelf of Canada and the United States on the species' summer feeding grounds. During the winter months, most of these fish depart the relatively shallow waters of the shelf to aggregate and spawn in deeper waters along the shelf-edge, at spawning grounds that stretch from at least the Queen Charlotte Islands through the Bering Sea and westward; however, rather than simply moving offshore from the locations at which they feed, conventional tagging

data suggest that many halibut may move considerable distances along the shore during the seasonal migration. Halibut appear to aggregate in northern GOA in the winter and may emigrate (arrive) from British Columbia and areas south of the Alaska Peninsula.

Rockfish of the Family Scorpaenidae inhabit rocky areas in shallow to moderately deep water or occur farther offshore on silty and sandy, soft bottoms in the marine waters of the TMAA and are represented by the genera *Sebastes* and *Sebastolobus* (Mecklenburg et al. 2002). Approximately 32 of the 36 species of *Sebastes* and two of the three species *Sebastolobus* species have been documented in the TMAA. Rockfish diversity is highest in southern southeast Alaska with the number of species declining markedly west of the central GOA (Enticknap and Sheard 2005). The rockfishes have been divided into three assemblages for management purposes based on species habitat and distribution, as well as commercial composition data: slope, demersal shelf, and pelagic shelf, whereas the thornyheads are managed independently (O'Connell et al. 2003; USDC, NOAA 2005). Rockfish are long-lived and sexual maturity is attained between 5 and 20 years of age. Spawning for most species generally takes place in the early spring (April) or late fall. Once hatched (late winter to mid-summer) the juvenile larvae form part of the pelagic community for up to 3 years and use nearshore habitats. Due to their long lives and late sexual maturity, rockfish are extremely susceptible to over harvest and stock depletion.

Species of sharks and skates that are known to occur in the GOA include salmon shark (*Lamna ditropis*), spiny dogfish (*Squalus acanthias*), big skate (*Raja binoculata*), and longnose skate (*R. rhina*). Sharks and skates form part of the benthic and near-bottom fish communities and are not classified as food fish. These species are often caught as bycatch in groundfish fisheries.

Summary of Fisheries Management

The oldest fisheries in the GOA are the native subsistence fisheries for Pacific halibut, cod, herring, and other species. Catches were traded or sold to the Russians and later to the Americans after the purchase of Alaska by the United States in 1867. Groundfish and herring are still important sources of food to many groups of Alaskan natives, although these subsistence harvests are now dwarfed by commercial operations (North Pacific Fishery Management Council [NPFMC] 2009).

The commercial fishery for halibut began in coastal waters off Washington and British Columbia and expanded from there into the GOA after World War I. Both U.S. and Canadian nationals were involved in the fisheries, and in 1923 the United States and Canada ratified a halibut conservation treaty to regulate the fishery and to conduct research. The convention established the International Fisheries Commission, which was changed to the International Pacific Halibut Commission in 1953. Because of a combination of overfishing and environmental factors, the abundance of halibut declined and a new convention was signed in 1930 to broaden the Commission's regulatory powers for the rebuilding of the halibut stocks. Under scientific management, the halibut stocks were gradually rebuilt (NPFMC 2009). The potential adverse impact on halibut from the commercial groundfish fisheries is such that it must be taken into account in the management of the groundfish fishery.

Commercial groundfish are managed through the NPFMC's GOA Groundfish Fishery Management Plans, but the International Pacific Halibut Commission is responsible for management of the North American Pacific halibut fishery, under the authority of the Convention for the Preservation of the Halibut Fishery of the North Pacific Ocean and the Bering Sea. Within the Groundfish Fishery Management Plan, the flatfish assemblage has been divided into several categories for management purposes. Catch limits for flatfish are specified separately for the deep water flatfish complex (Dover sole, Greenland turbot, and deep-sea sole), rex sole, the shallow water flatfish complex (rock sole, yellowfin sole, Alaska plaice, and other flatfish), flathead sole, and arrowtooth flounder.

The eastern north Pacific halibut resource is presently managed under the assumption that a single panmictic population (i.e., a fully mixed population in which members from all geographic regions regularly interbreed) exists from California through the eastern Bering Sea (International Pacific Halibut Commission [IPHC] 2010). This assumption rests largely upon studies that indicate northwesterly larval drift throughout the GOA and into the Bering Sea, balanced by southeasterly migration of juveniles and adults over broad geographic expanses. In addition, limited genetic studies have failed to demonstrate significant difference between northern and southern stock components. Thus, Pacific halibut in the eastern Pacific Ocean are treated as a single unit stock with regard to reproduction and recruitment, and managed as a series of regulatory areas with respect to harvest guidelines (IPHC 2010).

The IPHC regulatory or statistical areas are depicted in Figure 3.6-1. The boundaries of the TMAA overlap with five IPHC statistical areas: 230, 240, 250, 260, and 270. The overlap with statistical areas 230 and 270 is very small compared with a larger overlap in areas 240, 250, and 260. The halibut fishery is conducted in these areas between March through November (IPHC 2010). The majority of the fishery occurs over the shelf in waters 200 meters or less; however there have been reports of halibut caught in much deeper waters (up to 500 meters) during the summer months (Adams pers. comm. 2010). The Alaska Fisheries Science Center of NMFS conducts annual surveys in the GOA and has found that the frequency of occurrence of halibut in the summer occurs at depths between 100-150 meters and the frequency sharply falls off at 200 meters. For example, out of 3,004 individuals caught in waters up to 550 meters deep, 2,958 individuals were caught in depths less than 200 meters, 46 individuals caught between 200-550 meters, and of those 46 fish only 8 individuals were caught at depths between 400 to 500 meters (Von Szalay pers. comm. 2010).

The sablefish fishery began about 1906, and was relatively unimportant until about 1935 when the catch began to increase with effort continuing through 1945. Since 1946, the harvest has fluctuated and, following a period of stock decline, the fishery has now expanded to all areas of the GOA (NPFMC 2009).

Fish Habitat in the Gulf of Alaska TMAA

Habitat characteristics include geomorphic, physical, biological, and chemical parameters. Interactions between environmental parameters make up habitat and determine the biological niche of a species.

Habitat parameters affecting fish distribution throughout the TMAA include both physical (depth, substrate, temperature, salinity, and dissolved oxygen) and biological (competitors, predators, and facilitators) variables (NMFS-Northwest Region [NWR] 2005). Habitat types in the GOA can be separated into two zoogeographic provinces: coastal Aleutian (Aleutian Islands to Sitka, Alaska, Dixon Entrance, or Cape Flattery, Washington) and oceanic Subarctic (GOA to Latitude 43°N). These provinces can further be broken down into the following habitat types utilized by managed fishes within the GOA (Briggs 1974, Feder and Jewett 1986, O'Clair and Zimmerman 1986, Allen and Smith 1988, Malecha et al. 2005, Peterson 2005).

As discussed in Section 3.5, the TMAA is over 12 nm (22.2 km) offshore and does not include nearshore habitat, but primarily consists of offshore open ocean habitats including pelagic, continental shelf, slope, and abyssal plain regions, which are influenced by both the ACC and the Alaska Gyre. However, a brief description of nearshore habitats is provided since some fishes may utilize this habitat throughout their life cycle.

Nearshore Habitats

Embayments

Embayments include bays, fjords, and inlets influenced by both the ocean and river and serve as the transitional zone between fresh and saltwater. Major embayments found north and northwest of the TMAA include Prince William Sound, Resurrection Bay, and lower Cook Inlet.

Islands

Islands include areas separated from the mainland by straits (Kodiak Island by Shelikof Strait) or occurring at mouth of embayments (Montague Island – Prince William Sound or Barrens Island – lower Cook Inlet).

Nearshore Biogenic Habitats

Nearshore biogenic habitats include kelp, seagrass, and epifaunal invertebrates. The biological component (kelp, seagrass, or epifaunal invertebrates) associated with the habitat is generally the feature that makes that habitat suitable for a particular species or life stage (e.g., groundfish).

Nearshore Unconsolidated Bottom (silt, mud, gravel, or mixed)

Composed of small particles (gravel, sand, mud, silt, or mixtures of these particles), these areas contain little to no vegetation due to the lack of stable surfaces for attachment. Contains infaunal invertebrates (i.e., polychaetes, other worms, bivalves) and abundant transient consumers (e.g., fishes, crustaceans, shorebirds).

Nearshore Hardbottom

Nearshore hardbottom is composed of bedrock, boulders, cobble, or gravel/cobble. Nearshore hardbottom is one of the least abundant benthic habitats, but one of the most important for fishes, especially rockfish (e.g., *Sebastes* spp.), lingcod, and sculpins. Most Alaska Pacific herring stocks spawn in intertidal and shallow subtidal hardbottom.

Nearshore Water Column

The nearshore water column, or coastal epipelagic zone, includes egg, juvenile, and larval stages of groundfish commonly associated with macrophyte canopies or drift algae.

Offshore (Shelf and Slope Habitats)

Offshore Biogenic Habitats (corals, sponges, etc.)

Biogenic habitats include structure-forming invertebrates such as corals, basketstars, brittlestars, demosponges, gooseneck barnacles, sea anemones, sea lilies, sea urchins, sea whips, tube worms, and vase sponges.

Offshore Unconsolidated Bottom (silt, mud, sand, gravel, or mixed)

Unconsolidated bottom is composed of cobble, gravel, sand, or silt which contains little to no vegetation due to the lack of stable surfaces for attachment.

Offshore Hardbottom

The hardbottom is composed of bedrock, boulders, cobble, or gravel/cobble. Large, mobile, demersal fishes (e.g., rockfish, sablefish, Pacific hake, spotted ratfish) are typically associated with this habitat.

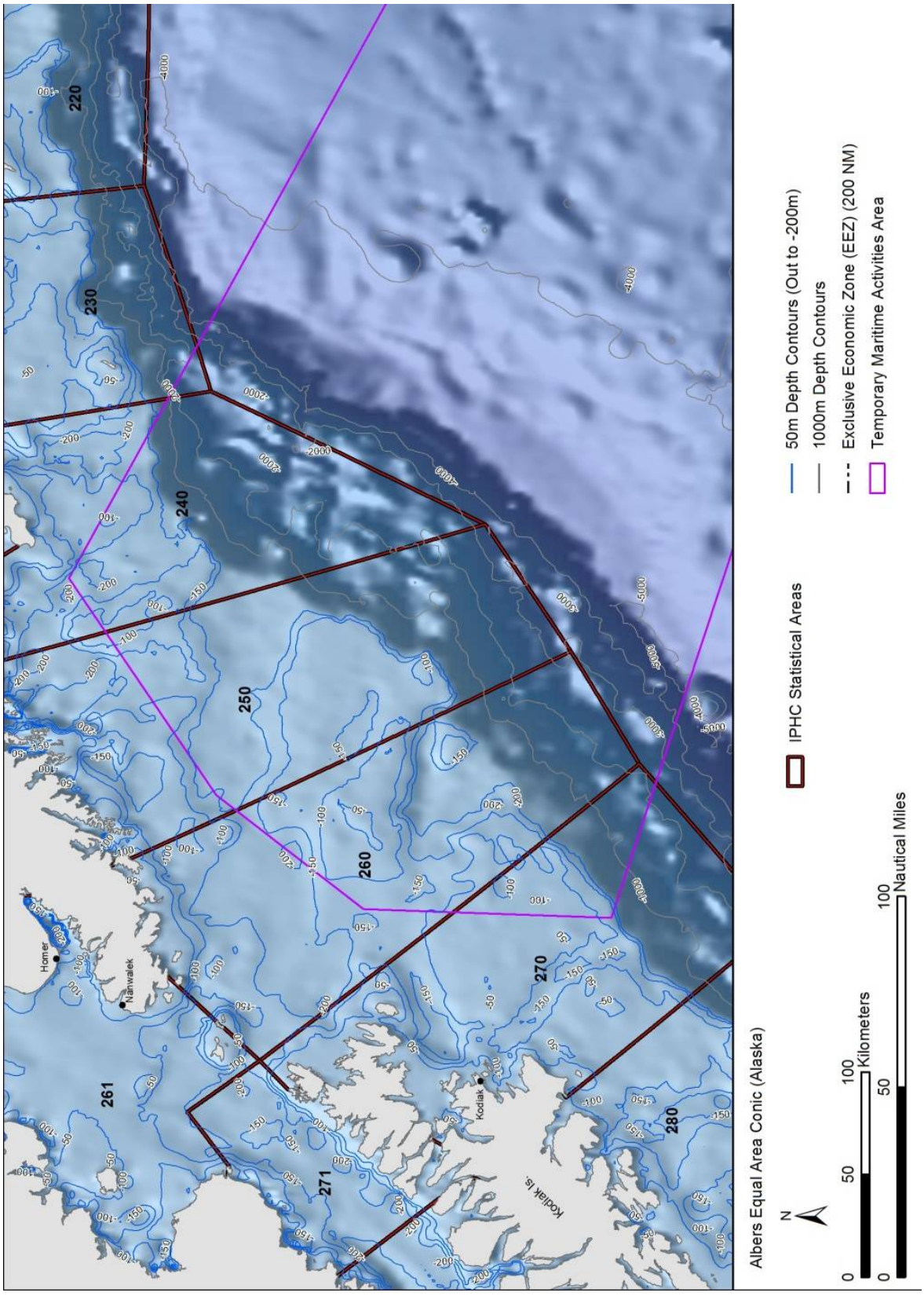


Figure 3.6-1: International Pacific Halibut Commission Statistical Areas

Offshore Artificial Structures

Artificial structures include artificial reefs utilized by rockfish. Artificial reefs are often composed of concrete, tires, or sunken ships; these features create habitat for sea life.

Offshore Water Column: Pelagic Zone

The pelagic zone is home to the highly migratory species (e.g., high seas salmon), other relatively large pelagics, and early life stages of groundfish inhabiting the epipelagic/mesopelagic area or that are in association with fronts, current systems, and macrophyte canopies or drift algae associated with the TMAA.

3.6.1.2 Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) (16 United States Code [U.S.C.] §1801 et seq.), as amended by the Sustainable Fisheries Act (SFA), mandates identification and conservation of EFH. The MSFCMA defines EFH as those waters and substrates necessary (required to support a sustainable fishery and the managed species) to fish for spawning, breeding, feeding, or growth to maturity (i.e., full life cycle). These waters include aquatic areas and their associated physical, chemical, and biological properties used by fish, and may include areas historically used by fish. Substrate types include sediment, hard bottom, structures underlying the waters, and associated biological communities. Federal agencies are required to consult with NMFS and to prepare an EFH Assessment if potential adverse effects on EFH are anticipated from their activities. A detailed EFH Assessment has been prepared for the TMAA.

The NMFS and regional Fishery Management Councils (FMCs) develop EFH descriptions for federally managed fish species and include them in their respective Fishery Management Plans (FMPs). The FMPs identify and describe EFH, describe the EFH impacts (fishing and nonfishing), and suggest measures to conserve and enhance the EFH. The NPFMC developed FMPs for all fisheries occurring within the boundary of the TMAA. A description of designated EFH for the life stage that occurs within the TMAA is presented in Tables 3.6-1 and 3.6-2. The GOA is defined in the FMP as the U.S. EEZ of the North Pacific Ocean, exclusive of the Bering Sea, between the eastern Aleutian Islands at 170°W longitude and Dixon Entrance at 132°40'W longitude and includes the Western, Central, and Eastern regulatory areas (USDC, NOAA 2005).

Table 3.6-1: The Fish and Invertebrate Species with EFH Designated in the Gulf of Alaska TMAA

Fishery Management Plan	Species	Eggs	Larvae	Early Juvenile	Late Juvenile	Adult
Scallop	Weathervane scallop				X	X
Groundfish	Arrowtooth flounder		X		X	X
	Atka mackerel		X			
	Dover sole	X	X		X	X
	Dusky rockfish		X			X
	Flathead sole	X	X		X	X
	Northern rockfish		X			X
	Pacific cod	X	X		X	X
	Pacific ocean perch		X		X	X
	Rex sole	X	X		X	X
	Rock sole		X		X	X
	Sablefish	X	X		X	X
	Sculpins				X	X

Table 3.6-1: The Fish and Invertebrate Species with EFH Designated in the Gulf of Alaska TMAA (continued)

Fishery Management Plan	Species	Eggs	Larvae	Early Juvenile	Late Juvenile	Adult
Groundfish (continued)	Shortraker / rougheye rockfish		X			X
	Skates					X
	Squid				X	X
	Thornyhead rockfish		X		X	X
	Walleye Pollock	X	X		X	X
	Yelloweye rockfish		X		X	X

Table 3.6-2: Salmon Species with EFH Designated in the Gulf of Alaska TMAA

Fishery Management Plan	Species	Freshwater Eggs	Freshwater Larvae/ Juveniles	Estuarine Juveniles	Marine Juveniles	Marine Immature/ Maturing Adults	Freshwater Adults
Salmon	Chinook				X	X	
	Chum				X	X	
	Coho				X	X	
	Pink				X	X	
	Sockeye				X	X	

The status, distribution, habitat preference (substrate, depth, temperature, and salinity), life history (migration, movements, and spawning), common prey species, and EFH designations of the species complexes and/or individual species are summarized in greater detail in an EFH Assessment prepared by the Navy.

Habitat Areas of Particular Concern (HAPCs) are a subset of EFH. FMCs are encouraged to designate HAPCs under the MSFCMA. HAPCs are identified based on habitat level considerations rather than species life stages as are identified with EFH. EFH guidelines published in federal regulations identify HAPCs as types or areas of habitat within EFH that are identified based on one or more of the following considerations:

- The importance of the ecological function provided by the habitat.
- The extent to which the habitat is sensitive to human-induced environmental degradation.
- Whether, and to what extent, development activities are or will be stressing the habitat type.
- The rarity of the habitat type (50 Code of Federal Regulations [C.F.R.] 600.815(a)(8))

Several habitat types identified as HAPCs (areas with living substrates in shallow/deep waters) focus on specific habitat locations, such as seamounts and hard coral areas (NPFMC 2005a). Amendments to the FMP for salmon fisheries in the EEZ off the coast of Alaska, the FMP for the scallop fishery off Alaska, and the FMP for groundfish of the GOA have established the following Habitat Conservation Areas and Habitat Protection Areas in the GOA: 10 Gulf of Alaska Slope Habitat Conservation Areas (GOASHCAs), 15 Alaska Seamount Habitat Protection Areas (ASHPAs), and 5 Gulf of Alaska Coral Habitat Protection Areas (NMFS 2006). Within the TMAA, one GOASHCA (Cable) and three ASHPAs (Dall, Giacomini, and Quinn Seamounts) occur almost entirely within the TMAA (Figure 1-24). Other

areas, such as the Kodiak Seamount and Middleton West GOASHCA are partially located in the TMAA (see Figure 3.5-7).

Scallop Fishery Management Plan

Scallops are managed jointly by NMFS and Alaska Department of Fish and Game (ADFG) under the FMP for the Scallop Fishery off Alaska (NPFMC 2004b). This FMP covers all scallop stocks off the coast of Alaska including the weathervane (*Patinopecten caurinus*), pink (*Chlamys rubida*), spiny (*C. hastata*), and rock (*Crassadoma gigantea*), scallops representing the family Pectinidae (USDC, NOAA 2005). Of the four scallop species, the weathervane scallop is the only commercially exploited scallop in Alaskan waters that has EFH designated within the TMAA (USDC, NOAA 2005). Therefore, the other three scallop species are not discussed further. A description of EFH for the life stage that occurs within the TMAA is presented in Table 3.6-1.

Groundfish Fishery Management Plan

The GOA Groundfish FMP and its management regime govern all stocks of finfish (including squid and octopus), except salmon, steelhead, halibut, herring, and tuna. The groundfish complex separates the species into five categories: (1) prohibited species – species and/or species of groups whose catch must be returned to the sea with a minimum of injury except when their retention is authorized by other applicable law (e.g., King and Tanner crabs [*Paralithodes*/*Lithodes* spp. and *Chionoecetes* spp.], Pacific halibut, Pacific herring [*Clupea pallasii*], Pacific salmon, steelhead trout); (2) target species – commercially important species generally targeted by groundfish fishery (e.g., walleye pollock, Pacific cod); (3) other species – are not usually targeted, have little current economic value, but may contain significant components of the ecosystem or have economic potential (e.g., sharks, sculpins); (4) forage fish species – critical food source for many marine mammals, seabirds, and fish species (e.g., smelts, euphausiids); and (5) nonspecified species – species and species groups of no current economic value taken by the groundfish fishery only as incidental catch in the target fisheries (e.g., grenadiers, eelpouts, sea urchins, mussels, etc.) (USDC, NOAA 2005; NPFMC 2005a). EFH provisions of the MSFCMA do not apply to prohibited and nonspecified species (unless these species are included in the fishery management unit of another FMP), e.g., Bering Sea/Aleutian Island crab species or salmon fisheries (USDC, NOAA 2005).

Target species consist of the following groups: 13 flatfish species (right-eye flounders) consisting of a single family, 32 rockfish and two thornyheads in the family Scorpaenidae; four roundfish species representing three families; and five skate species in the family Rajidae. Other species consist of six sculpins representing two families, three sharks from three families, four squids consisting of two families, and two octopuses representing two families (see Table 3.6-1) (NPFMC 2005b). The forage fish species comprises nine fish families and one crustacean order Euphausiacea (NPFMC 2005a). EFH designation is based upon the aquatic habitat necessary for groundfish production in supporting a long-term sustainable fisheries and contributing to a healthy ecosystem (USDC, NOAA 2005). According to the Final EIS (FEIS) for EFH Identification and Conservation in Alaska, other species, such as sharks, octopi, and forage fishes are lacking sufficient information to define EFH (USDC, NOAA 2005). Therefore, of all the species or assemblages listed in the Groundfish FMP, 18 species or assemblages have sufficient information and designated EFH within the TMAA (Table 3.6-1).

Description

Fifty-nine of the 66 NPFMC managed groundfish species are known to occur in the GOA, including the TMAA (USDC, NOAA 2005). These groundfish species occupy various marine environments including estuaries, tideland marshes, bays, fjords, sandy beaches, unprotected rocky shores, river deltas, and a variety of continental shelf, slope, seamounts, and deep ocean habitats encompassing different physical and biological attributes at various stages in their life histories (Hood and Zimmerman 1986). Research on the life histories and habitats of these species varies in completeness, so while some species are well

studied, there is relatively little information on other species. The status, distribution, habitat preference (substrate, depth, temperature, and salinity), life history (migration, movements, and spawning), common prey species, and EFH designations of the species complexes and/or individual species are summarized below, with greater detail provided in an EFH Assessment prepared by the Navy (NPFMC 1990, 2004b, 2005b).

The flatfishes in the GOA have been divided into several categories for management purposes. With the exception of arrowtooth flounder, rex sole, and flathead sole, which are managed as individual species, the remaining flatfishes are managed as "shallow-water" and "deepwater" assemblages (USDC, NOAA 2005). Each of the managed individual species has its own EFH designation (Table 3.6-1). The EFH designation of the Alaska plaice and rock and yellowfin soles best represents the shallow-water assemblage, whereas the Dover sole best represents the deepwater assemblage (USDC, NOAA 2005).

Status

According to NMFS (2005a) and NPFMC (2004a), no groundfish stocks are designated as overfished. The abundances of Pacific cod (*Gadus macrocephalus*), Pacific ocean perch (*Sebaste alutus*), northern rockfish (*S. polyspinis*), dusky rockfish (*S. ciliatus*), thornyheads, flathead sole (*Hippoglossoides elassodon*), Dover sole, and arrowtooth flounder are above target stock size, whereas abundances of walleye pollock are below target stock size (NPFMC 2004a). The relative abundances of other deepwater flatfish, shallow-water flatfish, rex sole, shortraker rockfish (*S. borealis*), rougheye rockfish (*S. aleutianus*), demersal shelf rockfish, other pelagic shelf rockfish, other slope rockfish, Atka mackerel (*Pleurogrammus monopterygius*), and skates are unknown (NMFS 2004a).

Currently, the various individual species comprising the groundfish complex are not listed as threatened or endangered or species of concern (formerly candidate species) under the ESA in the TMAA. Five groundfish species are on the IUCN Red List of Threatened Species. Bocaccio (*S. paucispinis*) is considered critically endangered due to an estimated reduction of at least 80 percent of its population over the last 10 years or three generations. The shortspine thornyhead (*Sebastolobus alascanus*) is considered endangered due to an estimated reduction of at least 50 percent of its population over the last 10 years or three generations. The salmon shark is listed as data deficient, and the big skate is listed as lower risk, but near threatened. The spiny dogfishes' northeast Pacific subpopulation is listed as vulnerable due to the fisheries overexploitation of this species because of its late maturity, low capacity to reproduce, longevity, generation time (25 to 40 years), and a low intrinsic population rate increase of 2 to 7 percent per year. According to the Food and Agriculture Organization (FAO), the salmon shark is listed as category 1 due to a lack of fisheries data (Castro et al. 1999).

High Seas Salmon Plan Fishery Management Plan

Description

Five species of Pacific salmon (Chinook, coho, chum, pink, and sockeye salmon) have EFH designated within the TMAA (Duffy et al. 2005). All species are similar in appearance and have an anadromous life history (USDC, NOAA 2005). Anadromous salmon depend on the ecological integrity and connectivity of a suite of habitats extending from the natal freshwater spawning or rearing streams to estuaries and then to coastal, shelf, and offshore waters for their growth (Groot and Margolis 1991). The relative importance of estuarine and coastal marine environments differs within and among the various salmon species due to differences in residence times and utilization of these environments (PICES 2004). All species of salmon spawn in gravel beds in freshwater rivers and streams, or along lake-shores (Thorpe 1994, Anchor Environmental L.L.C. and People for Puget Sound 2002). Coho and Chinook salmon typically migrate to sea after extended periods of rearing as juveniles in freshwaters; whereas pink salmon do not rear long in freshwater and migrate to sea soon after emergence from natal gravel beds (Duffy et al. 2005). Juvenile salmon reside mainly in nearshore intertidal waters, which provide five key functions:

migration corridors, food production, physiological refuge, refuge from predators, and high-energy refuge (Good et al. 2005). After achieving some size threshold or after a temporal cue (e.g., a specific residence time), salmon move from shallow nearshore to offshore surface waters in estuarine and marine waters (NMFS 2005b, 2005c, USFWS 2005).

EFH Designations

Salmon EFH includes streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon. The geographic extent of marine EFH for salmon extends from the nearshore and tidal submerged environments within state territorial seas out to the full extent of the Exclusive Economic Zone (EEZ), 200 nm offshore (PFMC 2000, USDC; NOAA 2005). Freshwater EFH for salmon (streams, lakes, ponds, or wetlands) is not within the TMAA. For more information on freshwater EFH, see USDC, NOAA (2005).

Status

None of these high seas salmon are currently listed on the International Union for Conservation of Nature and Natural Resources (IUCN) red list of threatened species. Those species listed under the ESA are discussed in Section 3.6.1.3.

3.6.1.3 Threatened and Endangered Species

The Navy is currently conducting ESA Section 7 consultations with NMFS to address effects to listed fish species for the Preferred Alternative (Alternative 2).

Federally listed species of fish are identified by Evolutionarily Significant Units (ESUs) or Distinct Population Segments (DPSs). This policy indicates that one or more naturally reproducing populations will be considered to be distinct population segments and, hence, a species under the ESA, if they represent an ESU or DPS of the biological species. To be considered an ESU, a population must satisfy two criteria: (1) It must be reproductively isolated from other population units of the same species, and (2) it must represent an important component in the evolutionary legacy of the biological species (Good et al. 2005). The first criterion, reproductive isolation, need not be absolute but must have been strong enough to permit evolutionarily important differences to occur in different population units. The second criterion is met if the population contributes substantially to the ecological or genetic diversity of the species as a whole (NMFS 1999). The DPS policy adopts criteria similar to, but somewhat different from, those in the ESU policy for determining when a group of vertebrates constitutes a DPS: the group must be discrete from other populations and it must be significant to its taxon (NMFS 2006).

Once an ESU or DPS is listed, the ESA requires NOAA and USFWS to designate "critical habitat" for the species. "Critical habitat" is defined as: 1) specific areas within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and 2) specific areas outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation.

Salmonids

Various listed ESUs or DPSs of salmonids (Chinook salmon, coho salmon, chum salmon, sockeye salmon, and steelhead) migrate north to mature in the GOA and may occur in the TMAA (Table 3.6-3). While these listed salmonids have designated critical habitat, none of the critical habitat occurs within the TMAA. Salmon (Chinook and coho, in particular) support important traditional, commercial, and recreational fisheries in the GOA and have long been an integral part of the Native American culture (NPFMC 1990). Salmon are extremely important to both marine and terrestrial ecosystems (Gende et al. 2002).

Table 3.6-3: Pacific Salmonid ESUs and DPSs in the TMAA and Vicinity

Species	ESU	ESA Listing Status	Critical Habitat in TMAA
Chinook Salmon	Sacramento River Winter-run	Endangered	No
	Upper Columbia River Spring-run	Endangered	No
	Snake River Spring/Summer-run	Threatened	No
	Snake River Fall-run	Threatened	No
	Central Valley Spring-run	Threatened	No
	California Coastal	Threatened	No
	Puget Sound	Threatened	No
	Lower Columbia River	Threatened	No
	Upper Willamette River	Threatened	No
Coho Salmon	Central California Coast	Endangered	No
	Southern Oregon / Northern California Coasts	Threatened	No
	Lower Columbia River	Threatened	No
	Oregon Coast	Threatened	No
Chum Salmon	Hood Canal Summer-run	Threatened	No
	Columbia River	Threatened	No
Sockeye Salmon	Snake River	Endangered	No
	Ozette Lake	Threatened	No
Steelhead Trout	Southern California	Endangered	No
	Upper Columbia River	Threatened	No
	Snake River Basin	Threatened	No
	Middle Columbia River	Threatened	No
	Lower Columbia River	Threatened	No
	Upper Willamette River	Threatened	No
	South-Central California Coast	Threatened	No
	Central California Coast	Threatened	No
	Northern California	Threatened	No
	California Central Valley	Threatened	No
	Puget Sound	Threatened	No

Source: NMFS 2009

Chinook Salmon

The Chinook salmon's historical range in North America extended from the Ventura River in California to Point Hope, Alaska (Myers et al. 1998). The natural freshwater range for Chinook salmon extends throughout the Pacific Rim of North America. This species has been identified from the San Joaquin River in California to the Mackenzie River in northern Canada (Healey 1991). The oceanic range encompasses Washington, Oregon, California, throughout the north Pacific Ocean, and as far south as the U.S./Mexico border (PFMC 2000). Offshore ocean distribution is generally more limited (within 200 miles [mi] of the coast) for Chinook than other Pacific salmonids (NPFMC 1990).

Chinook salmon exhibit one of the more diverse and complex life history strategies of all Pacific salmon and are separated into two generalized life-history types: stream-type and ocean-type (Myers et al. 1998, PFMC 2000). Timing of migration to seawater for juveniles is highly variable (PFMC 2000). Ocean-type juveniles may migrate to the ocean immediately after hatching in the late winter or early spring, but most

remain in freshwater for 30 to 90 days (USDC, NOAA 2005). Ocean-type juveniles typically inhabit estuaries for several months before migrating to higher salinity waters (PFMC 2000). Stream-type juveniles pass quickly through estuaries, are highly migratory, and may make extensive migrations in the open ocean (USDC, NOAA 2005). Fry enter the upper reaches of estuaries in late winter for the more southern populations or early spring for the more northern populations (PFMC 2000). For a year or more, they reside as fry or parr in freshwater where they exhibit downstream dispersal and utilize a variety of freshwater rearing environments before migrating to sea (Healey 1991). They perform extensive offshore oceanic migrations and return to their natal river during the spring and early summer, several months prior to spawning (Healey 1991). Ocean residency varies but may last from 1 to 6 years (Healey 1991). Stream-type adults often enter freshwater in the spring and summer as immature fish and spawn in upper watersheds in late summer or early fall (PFMC 2000). Stream-type life histories are most common in Alaska, but ocean-type populations are also present in a few watersheds (USDC, NOAA 2005).

Ocean-type Chinook migrate to the ocean within the first year (typically within a few months) after emergence where they spend an average of 4 to 5 years. (Myers et al. 1998, PFMC 2000, Augerot and Foley 2005). Ocean-type Chinook salmon spend most of their ocean life in coastal waters, and return to their natal rivers from spring to winter (Healey 1991). Spawning may range from May/June to December/January depending on location but periods are specific for each run and/or stock (Emmett et al. 1991, Healey 1991, PFMC 2000). Spawning may occur from the tidewater to 1,988 mi (3,200 km) upstream (Healey 1991). Stream-type and ocean-type spawning populations are separated considerably (Healey 1991). In North America there seems to be a sudden shift from stream-type to ocean-type stocks somewhere around Alaska-British Columbia border (Healey 1991). South of approximately 56^{o}N, stream-type Chinook are only found in larger rivers with ocean-type salmon dominating the majority of the runs (Healey 1991).

Chinook salmon may return to their natal streams during any month but there are one to three peaks associated with salmon migratory activity (Healey 1991). These peaks vary between river systems. Northern river systems generally see a single peak in migratory activity around June, although runs can possibly occur from April to August (Healey 1991). As you go farther south, runs occur progressively later (Healey 1991).

Within the TMAA, early life history stages for Chinook occur in freshwater but juveniles and adults utilize marine habitats. Juvenile Chinook prefer coastal areas (less than 34 mi [55 km]) throughout California, Oregon, and Washington, north to the Strait of Georgia and the Inland Passage, Alaska (PFMC 2000). The majority of marine juveniles are found within 17 mi (28 km) of the coast (PFMC 2000). They tend to concentrate around areas of pronounced coastal upwellings (PFMC 2000). Populations originating north of Cape Blanco, Oregon migrate north to the GOA, while populations originating south of Cape Blanco migrate south and west into the waters off California and Oregon (PFMC 2000). Chinook salmon spawning in rivers south of the Rogue River in Oregon rear in marine waters off California and Oregon, whereas, salmon spawning in rivers north of the Rogue River migrate north and west along the Pacific coast (USDC, NOAA 2005). These migrations are important from a management perspective since fish from Oregon, Washington, British Columbia, and Alaska have the potential of being harvested in the GOA (USDC, NOAA 2005).

Coho Salmon

Coho salmon are found in freshwater drainages from Monterey Bay, California north along the west coast of North America to Alaska, around the Bering Sea south through Russia to Hokkaido, Japan (California Department of Fish and Game [CDFG] 2002). Oceanic lifestages are found from Camalu Bay, Baja California north to Point Hope, Alaska and through the Aleutian Islands (Marine Biological Consultants [MBC] 1987, Sandercock 1991, USDC, NOAA 2005). In the northeastern Pacific, coho can be found south of 40^{o}N, but only in the coastal waters of the California Current (MBC 1987). Tagging studies have

shown coho originating from Washington and Oregon as far north as 60°N latitude and coho originating from California as far north as 58°N latitude (PFMC 2000). Oregon coho have been taken in offshore waters near Kodiak Island in the northern Gulf of Alaska. Westward migration of coho salmon appears to extend beyond the EEZ beginning at approximately 45°N latitude off the coast of Oregon (PFMC 2000). In strong upwelling years coho are more dispersed offshore, whereas in weak upwelling years they concentrate near submarine canyons and areas of consistent upwelling.

Adult coho migrate into streams where they deposit their eggs in gravel (Sandercock 1991). Eggs incubate throughout the winter and emerge in the spring as free-swimming fry (Sandercock 1991). Typical freshwater and estuarine residency time in Alaska is one to two years, though coho may spend up to 5 years if their growth is slow (USDC, NOAA 2005). Juveniles spend a minimum of 18 months at sea before returning to their natal streams to repeat the process (NPFMC 1990, Sandercock 1991).

Adult coho salmon migrate to their natal streams from June to February with northern populations beginning their return earlier than southern populations (Emmett et al. 1991, Sandercock 1991). Throughout their range, coho exhibit a variety of return timing patterns (Sandercock 1991). Most juvenile migration occurs from April to August with a peak in May (Emmett et al. 1991). Generally, as you move farther north, estuarine residency time for juveniles increases (PFMC 2000). Upon entering the ocean, coho may spend several weeks or their entire first summer in coastal waters before migrating north (PFMC 2000). In Alaska, coho spend up to 4 months in coastal waters before migrating offshore (USDC, NOAA 2005). Tag, release, and recovery studies suggest that coho salmon of California origin can be found as far north as southeast Alaska and salmon from Oregon and Washington as far north as the northern GOA (PFMC 2000). The extent of coho migrations appears to extend westward along the Aleutian Island chain ending somewhere around Emperor Seamount (believed to be an area of high prey abundance; PFMC 2000). The southern extent of the population expands and contracts annually, with Point Conception, California generally considered the faunal break for the coho and other temperate marine species (PFMC 2000). Offshore, juvenile coho are generally found in waters over the continental shelf, ranging from 23 to 46 mi (37 to 74 km) from shore (USDC, NOAA 2005). Adult coho may enter freshwater as early as July in the Alaska and as late as December or January in California (Sandercock 1991, PFMC 2000). Summer-run coho may enter rivers exceptionally early (spring or early summer; PFMC 2000). Larger rivers have a wider range of entry times than smaller systems (PFMC 2000).

Because of the coho's extended residency in freshwater environments (streams, ponds, and lakes), they are especially vulnerable to anthropogenic activities such as timber harvesting, mining, and road building (NPFMC 1990). Catch rates for coho in Alaska are at historically high levels and most stocks are rated as stable (USDC, NOAA 2005).

Chum Salmon

Chum salmon have the largest range of natural geographic and spawning distribution of all the Pacific salmon species (Pauley et al. 1988). Historically, in North America, chum salmon occurred from Monterey, California to the Arctic coast of Alaska and east to the Mackenzie River which flows into the Beaufort Sea. Present spawning populations are now found only as far south as Tillamook Bay on the northern Oregon coast (Salo 1991). Juvenile chum occur along the coast of North America and Alaska in a band that extends out to 22 mi (36 km) (Salo 1991).

Chum salmon are an anadromous species distributed throughout the North Pacific Ocean (Salo 1991). They are highly migratory with fry heading seaward immediately after emergence (NPFMC 1990, Salo 1991). Chum salmon do not have the clearly defined smolt stages that occur in other salmonids; however they are capable of adapting to seawater soon after emergence from the gravel (Salo 1991). Migrations of juvenile chum are correlated with the warming of nearshore waters (Salo 1991). They migrate to estuaries during their first spring or summer and spend little time rearing in freshwater (Pauley et al. 1988).

Juveniles enter estuaries from March to mid-May where they remain for several months (Emmett et al. 1991). As chum salmon grow, there is a general movement toward the ocean, moving offshore from April to June (Emmett et al. 1991). They then head north along the continental shelf until they reach the Gulf of Alaska (Emmett et al. 1991). Adults return to their natal streams at various ages but generally within 2 to 5 years (Salo 1991). Chum salmon return to their natal streams from June to January with more northern populations returning earlier than those to the south (USDC, NOAA 2005). The majority of chum spawning in Alaska is finished by November (USDC, NOAA 2005). For chum salmon, two spawning stocks exist: a northern stock that spawns from June to September and a southern (late-run) stock that spawns from August to January (Emmett et al. 1991).

Within the TMAA, early life history stages for chum salmon occur in freshwater but juveniles and adults utilize marine habitats. Juvenile chum migrations follow the GOA coastal belt to the north, west, and south during their first summer at sea (Salo 1991). While overall migration patterns of juvenile chum salmon within the GOA are understood, nearshore residency times and offshore migrations patterns are still unclear (Salo 1991). Migrations of immature fish during the late summer, fall, and winter occur in a broad southeasterly fashion, primarily south of 50°N and east of 155°W in the GOA. During the spring and early summer, chum salmon migrate to the north and west (Salo 1991). Maturing fish destined for North American streams are widely distributed throughout the GOA during the spring and summer (Salo 1991).

Sockeye Salmon

The sockeye salmon are primarily anadromous, where they migrate as juveniles from freshwater habitats to marine environments and return to freshwater habitats to spawn, but there are also distinct landlocked populations (kokanee) which never migrate to marine waters, spending their entire life cycle in fresh water habitats (Burgner 1991, Emmett et al. 1991).

After emergence, sockeye typically rear in lakes or glacial river sloughs for 1 to 3 years before migrating to the ocean (NPFMC 1990, Burgner 1991). Anadromous sockeye spend 1 to 4 years at sea before returning to their natal streams in the summer and autumn to spawn and eventually die. Offshore movements of sockeye are complex and are affected by a variety of physical factors (e.g., season, temperature, and salinity) and biological factors (e.g., life stage, age and size, availability and distribution of prey, and stock-of-origin; Burgner 1991). Juveniles generally remain in a band close to the coast upon entering the ocean environment (USDC, NOAA 2005). In British Columbia and southeast Alaska, juveniles are usually present in the open sea by late June. These fish are found moving northwestward into the GOA during July. This northwestward movement up the eastern Pacific Rim is followed by a southwestward migration along the Alaskan Peninsula (USDC, NOAA 2005).

In North America, spawning populations are found from the Sacramento River in California, north to Kotzebue Sound (Burgner 1991). Spawning is temperature-dependent and varies by location generally occurring from August to December and peaking in October (Emmett et al. 1991). Sockeye generally spawn in streams associated with lakes where the juveniles rear in the limnetic zone before they smoltify and migrate to the ocean (Pauley et al. 1989, Burgner 1991, Emmett et al. 1991). For this reason, the two largest spawning complexes are the Bristol Bay watershed in southwestern Alaska and the Fraser River watershed in British Columbia, both of which have extensive lake rearing habitats accessible to sockeye (Burgner 1991).

Within the TMAA, early life history stages for sockeye occurs in lakes and streams, but juveniles and adults utilize marine habitats and vicinity. Seaward migrations in Alaska begin in mid-May in association with salinity gradients (NPFMC 1990). Soon after entering the ocean, juvenile sockeye (excluding those from Bristol Bay) begin moving north into the GOA where they remain along the coastal belt until late-fall or early-winter. They then disperse offshore moving west and south (Emmett et al. 1991). In the

GOA, sockeye move north during the spring and summer and south and west during the winter (Emmett et al. 1991). Ocean residency for sockeye is 1 to 4 years (Pauley et al. 1989).

Steelhead Trout

Steelhead trout exhibit a great diversity of life history patterns, and are phylogenetically and ecologically complex. Steelhead may exhibit either an anadromous life style, or a freshwater residency, where they spend their entire life in freshwater (NMFS 1997). Freshwater residents are referred to as rainbow trout. Different life history forms include anadromous and nonanadromous, winter or summer steelhead, inland or coastal groupings, and half-pounder strategies. Some anadromous forms spend up to 7 years in freshwater and 3 years in the ocean prior to their first spawning (Busby et al. 1996), while other anadromous steelhead typically spend the first 2 years of their lives in freshwater, migrate to the marine environment and spend 2 to 3 years there, before returning to the freshwater environment to spawn at 4 to 5 years of age (McEwan and Jackson 1996, Schultz 2004).

Steelhead have excellent homing abilities and have been separated into two races depending on their return to their natal stream (winter-run and summer-run; Emmett et al. 1991). Winter-run steelhead migrate upstream during the fall, winter, and early spring, whereas summer-run steelhead migrate during the spring, summer, and early fall (Emmett et al. 1991). Winter steelhead enter their home stream in various stages of sexual maturation from November to April, and spawn within a few months of entering the river between late March and early May (Pauley et al. 1986). They are the most widespread of the two reproductive types. Coastal streams are dominated by winter steelhead, and there are only a few occurrences of inland winter steelhead populations (Busby et al. 1996). Juveniles generally rear in freshwater for 1 to 4 years before migrating to the ocean where they reside from 1 to 5 years (Emmett et al. 1991). Steelhead may also exhibit a "half-pounder" run (mostly summer steelhead) where they return to natal streams after only a few months at sea, overwinter, and then migrate back to the ocean (Emmett et al. 1991). Steelhead spend little time in estuaries and are abundant throughout the North Pacific and Gulf of Alaska (Emmett et al. 1991).

Spawning typically occurs from December to June; peaks are in February and March (McEwan and Jackson 1996). Steelhead can spawn more than once (iteroparity); all other species of Pacific *Oncorhynchus* spawn once and then die (semelparity). North of Oregon, repeat spawning is relatively uncommon and more than two spawning migrations is rare. Iteroparity occurs predominantly in females (Busby et al. 1996).

In the TMAA and vicinity, early life history stages of the steelhead are found only in freshwater habitats, while the later life history stages of the anadromous life form (i.e., juveniles and adults) utilize the marine environment. In the spring, Alaskan steelhead smolt leave their natal streams and enter the ocean where they reside for 1 to 3 years before returning to spawn (USDC, NOAA 2005). Populations may return in July (summer-run) or in August, September, and October (fall-run; USDC, NOAA 2005). Summer returns are rare in Alaska and are only found in a few southeast Alaska streams. Fall-run steelhead are much more common in Alaska, north of Frederick Sound, and are found in rivers, such as the Anchor, Nahu, Karluk, and Situk. Steelhead also exhibit spring runs (April, May, and June), but they are predominately found in southeast Alaska.

3.6.1.4 Hearing in Fish

All fish have two sensory systems that are used to detect sound in the water including the inner ear, which functions very much like the inner ear found in other vertebrates, and the lateral line, which consists of a series of receptors along the body of the fish (Popper 2008). The inner ear generally detects higher frequency sounds while the lateral line detects water motion at low frequencies (below a few hundred Hz) (Hastings and Popper 2005). A sound source produces both a pressure wave and motion of the medium

particles (water molecules in this case), both of which may be important to fish. Fish detect particle motion with the inner ear. Pressure signals are initially detected by the gas-filled swim bladder or other air pockets in the body, which then re-radiate the signal to the inner ear (Popper 2008). Because particle motion attenuates relatively quickly, the pressure component of sound usually dominates as distance from the source increases.

The lateral line system of a fish allows for sensitivity to sound (Hastings and Popper 2005). This system is a series of receptors along the body of the fish that detects water motion relative to the fish that arise from sources within a few body lengths of the animal. The sensitivity of the lateral line system is generally from below 1 Hz to a few hundred Hz (Coombs and Montgomery 1999, Webb et al. 2008). The only study on the effect of exposure to sound on the lateral line system (conducted on one freshwater species) suggests no effect on these sensory cells by intense pure tone signals (Hastings et al. 1996). While studies on the effect of sound on the lateral line are limited, Hasting et al.'s (1996) work, showing limited sensitivity to within a few body lengths and to sounds below a few hundred Hz, make the effect of the mid-frequency sonar of the Proposed Action unlikely to affect a fish's lateral line system. Therefore, further discussion of the lateral line in this analysis in unwarranted.

Broadly, fish can be categorized as either hearing specialists or hearing generalists (Scholik and Yan 2002). Fish in the hearing specialist category have a broad frequency range with a low auditory threshold due to a mechanical connection between an air filled cavity, such as a swimbladder, and the inner ear. Specialists detect both the particle motion and pressure components of sound and can hear at levels above 1 kilohertz (kHz). Generalists are limited to detection of the particle motion component of low-frequency sounds at relatively high sound intensities (Amoser and Ladich 2005). It is possible that a species will exhibit characteristics of generalists and specialists and will sometimes be referred to as an "intermediate" hearing specialist. For example, most damselfish are typically categorized as generalists, but because some larger damselfish have demonstrated the ability to hear higher frequencies expected of specialists, they are sometimes categorized as intermediate.

Of the fish species with distributions overlapping the TMAA for which hearing sensitivities are known, most are hearing generalists, including salmonid species.

Although hearing capability data only exists for fewer than 100 of the 29,000 fish species (Popper 2008), current data suggest that most species of fish detect sounds from 0.05 to 1.0 kHz, with few fish hearing sounds above 4 kHz (Popper 2008). Moreover, studies indicate that hearing specializations in marine species are quite rare and that most marine fish are considered hearing generalists (Popper 2003, Amoser and Ladich 2005). Specifically, the following species are all believed to be hearing generalists: elasmobranchs (i.e., sharks and rays) (Casper et al. 2003, Casper and Mann 2006, Myrberg 2001), scorpaeniforms (i.e., scorpionfishes, searobins, sculpins) (Lovell et al. 2005), scombrids (i.e., albacores, bonitos, mackerels, tunas) (Iversen 1967, Iversen 1969, Popper 1981, Song et al. 2006), damselfishes (Egner and Mann 2005, Kenyon 1996, Wright et al. 2005, Wright et al. 2007), and more specifically, midshipman fish (*Porichthys notatus*) (Sisneros and Bass 2003), Atlantic salmon (*Salmo salar*) (Hawkins and Johnstone 1978), and Gulf toadfish (*Opsanus beta*) (Remage-Healey et al. 2006). Moreover, it is believed that the majority of marine fish have their best hearing sensitivity at or below 0.3 kHz (Popper 2003). However, it has been demonstrated that marine hearing specialists, such as some Clupeidae, can detect sounds above 100 kHz. A list of fish hearing sensitivities is presented in Table 3.6-4.

In contrast to marine fish, several thousand freshwater species are thought to be hearing specialists. Nelson (1994) estimates that 6,600 of 10,000 freshwater species are otophysans (catfish and minnows), which are hearing specialists. Interestingly, many generalist freshwater species, such as perciforms (percids, gobiids) and scorpaeniforms (sculpins) are thought to have derived from marine habitats (Amoser and Ladich 2005). It is also thought that Clupeidae may have evolved from freshwater habitats

(Popper et al. 2004). This supports the theory that hearing specializations likely evolved in quiet habitats common to freshwater and the deep sea because only in such habitats can hearing specialists use their excellent hearing abilities (Amoser and Ladich 2005).

Table 3.6-4: Marine Fish Hearing Sensitivities

Family	Description of Family	Common Name	Scientific Name	Hearing Range (kHz)		Greatest Sensitivity (kHz)	Sensitivity Classification
				Low	High		
Albulidae	Bonefishes	Bonefish	*Albula vulpes*	0.1	0.7	0.3	Generalist
Anguillidae	Eels	European eel	*Anguilla anguilla*	0.01	0.3	0.04-0.1	Generalist
Ariidae	Catfish	Hardhead sea catfish	*Ariopsis felis*	0.05	1	0.1	Generalist
Batrachoididae	Toadfishes	Midshipman	*Porichthys notatus*	.065	0.385		Generalist
		Gulf toadfish	*Opsanus beta*			<1	Generalist
Clupeidae	Herrings, shads, menhadens, sardines	Alewife	*Alosa pseudoharengus*		0.12		Specialist
		Blueback herring	*Alosa aestivalis*		0.12		Specialist
		American shad	*Alosa sapidissima*	0.1	0.18	0.2-0.8 and 0.025-0.15	Specialist
		Gulf menhaden	*Brevoortia patronus*		0.1		Specialist
		Bay anchovy	*Anchoa mitchilli*		4		Specialist
		Scaled sardine	*Harengula jaguana*		4		Specialist
		Spanish sardine	*Sardinella aurita*		4		Specialist
		Pacific herring	*Clupea pallasii*	0.1	5		Specialist
Chondrichthyes [Class]	Cartilaginous fishes, rays, sharks, skates			0.2	1		Generalist
Gadidae	Cods, gadiforms, grenadiers, hakes	Cod	*Gadus morhua*	0.002	0.5	0.02	Generalist
Gobidae	Gobies	Black goby	*Gobius niger*	0.1	0.8		Generalist
Holocentridae	Squirrelfish and soldierfish	Shoulderbar soldierfish	*Myripristis kuntee*	0.1	3.0	0.4-0.5	Specialist
		Hawaiian squirrelfish	*Adioryx xantherythrus*	0.1	0.8		Generalist
Labridae	Wrasses	Tautog	*Tautoga onitis*	0.01	0.5	0.037-0.050	Generalist
		Blue-head wrasse	*Thalassoma bifasciatum*	0.1	1.3	0.3-0.6	Generalist
Lutjanidae	Snappers	Schoolmaster snapper	*Lutjanus apodus*	0.1	1.0	0.3	Generalist
Myctophidae	Lanternfishes	Warming's lanternfish	*Ceratoscopelus warmingii*				Specialist
Pleuronectidae	Flatfish, including Pacific halibut	Dab	*Limanda limanda*	0.03	0.27	0.1	Generalist
		European plaice	*Pleuronectes platessa*	0.03	0.2	0.11	Generalist

Table 3.6-4: Marine Fish Hearing Sensitivities (continued)

Family	Description of Family	Common Name	Scientific Name	Hearing Range (kHz)		Greatest Sensitivity (kHz)	Sensitivity Classification
				Low	High		
Pomadasyidae	Grunts	Blue striped grunts	*Haemulon sciurus*	0.1	1.0		Generalist
Pomacentridae	Damselfish	Sergeant major damselfish	*Abudefduf saxatilis*	0.1	1.6	0.1-0.4	Generalist/ Intermediate
		Bicolor damselfish	*Stegastes partitus*	0.1	1.0	0.5	Generalist/ Intermediate
		Nagasaki damselfish	*Pomacentrus nagasakiensis*	0.1	2.0	<0.3	Generalist/ Intermediate
Salmonidae	Salmons	Atlantic salmon	*Salmo salar*	<0.1	0.58		Generalist
Sciaenidae	Drums, weakfish, croakers	Atlantic croaker	*Micropogonias undulatus*	0.1	1.0	0.3	Generalist
		Spotted sea trout	*Cynoscion nebulosus*				Generalist
		Kingfish	*Menticirrhus americanus*				Generalist
		Spot	*Leiostomus xanthurus*	0.2	0.7	0.4	Generalist
		Black drum	*Pogonias cromis*	0.1	0.8	0.1-0.5	Generalist
		Weakfish	*Cynoscion regalis*	0.2	2.0	0.5	Specialist
		Silver perch	*Bairdiella chrysoura*	0.1	4.0	0.6-0.8	Specialist
Scombridae	Albacores, bonitos, mackerels, tunas	Bluefin tuna	*Thunnus thynnus*		1.0		Generalist
		Yellowfin tuna	*Thunnus albacares*	0.5	1.1		Generalist
		Kawakawa	*Euthynnus affinis*	0.1	1.1	0.5	Generalist
		Skipjack tuna	*Katsuwonus pelamis*				Generalist
Scorpaenidae	Scorpionfishes searobins, sculpins	Sea scorpion	*Taurulus bubalis*				Generalist
Serranidae	Seabasses, groupers	Red hind	*Epinephelus guttatus*	0.1	1.1	0.2	Generalist
Sparidae	Porgies	Pinfish	*Lagodon rhomboides*	0.1	1.0	0.3	Generalist
Triglidae	Scorpionfish, searobins, sculpins	Leopard searobin	*Prionotus scitulus*	0.1	0.8	0.39	Generalist

Sources: Astrup 1999; Astrup and Mohl 1993; Casper and Mann 2006; Casper et al. 2003; Coombs and Popper 1979; Dunning et al. 1992; Egner and Mann 2005; Gregory and Clabburn 2003; Hawkins and Johnstone 1978; Higgs et al. 2004; Iversen 1967, 1969; Jorgensen et al. 2005; Kenyon 1996; Lovell et al. 2005; Mann et al. 1997, 2001, 2005; Myrberg 2001; Nestler 2002; Popper 1981, 2008; Popper and Carlson 1998; Popper and Tavolga 1981; Ramcharitar and Popper 2004; Ramcharitar et al. 2001, 2004, 2006a; Remage-Healey et al. 2006; Ross et al. 1996; Sisneros and Bass 2003; Song et al. 2006; Wright et al. 2005, 2007

Some investigators (e.g., Amoser and Ladich 2005) hypothesize that, within a family of fish, different species can live under different ambient sound conditions, which requires them to adapt their hearing abilities. Under this scenario, a species' probability of survival would be greater if it increased the range over which the acoustic environment, consisting of various biotic (sounds from other aquatic animals) and abiotic (wind, waves, precipitation) sources, could be detected. For the marine environment, Amoser and

Ladich (2005) cite the differences in the hearing ability of two species of Holocentridae as a possible example of such environmentally-derived specialization. Both the shoulderbar soldierfish (*Myripristis kuntee*) and the Hawaiian squirrelfish (*Adioryx xantherythrus*) can detect sounds at 0.1 kHz. However, the high-frequency end of the auditory range extends towards 3 kHz for the shoulderbar soldierfish but only to 0.8 kHz for the Hawaiian squirrelfish (Coombs and Popper 1979). Though these two species live in close proximity on the same reefs, it is not certain that differing environmental conditions cause the hearing variations (Popper 2008). Wysocki and Ladich (2005) suggest that ambient sound regimes may limit acoustic communication and orientation of hearing specialists in particular. Generally, a clear correlation between hearing capability and the environment cannot be asserted or refuted due to limited knowledge of ambient sound levels in marine habitats and a lack of comparative studies.

Susceptibility to the effects of anthropogenic sounds has been shown to be influenced by developmental and genetic differences in the same species of fish. In an exposure experiment, Popper et al. (2007) found that experimental groups of rainbow trout had substantial differences in hearing thresholds. While fish were attained from the same supplier, it is possible different husbandry techniques may be the reason for the differences in hearing sensitivity. These results emphasize that caution should be used in extrapolating data beyond their intent.

Among all fishes studied to date, perhaps the greatest variability is found within the family Sciaenidae (i.e., drumfish, weakfish, croaker), where there is extensive diversity in inner ear structure and the relationship between the swim bladder and the inner ear. Specifically, the Atlantic croaker's (*Micropogonias undulatus*) swim bladder has forwardly directed diverticulae that come near the ear but do not actually touch it. However, the swim bladders in the spot (*Leiostomus xanthurus*) and black drum (*Pogonias cromis*) are further from the ear and lack anterior horns or diverticulae. These differences are associated with variation in both sound production and hearing capabilities (Ladich and Popper 2004; Ramcharitar et al. 2006a). Ramcharitar and Popper (2004) discovered that the black drum responded to sounds from 0.1 to 0.8 kHz and was most sensitive between 0.1 and 0.5 kHz, while the Atlantic croaker responded to sounds from 0.1 to 1 kHz and was most sensitive at 0.3 kHz. Additional sciaenid research by Ramcharitar et al. (2006b) investigated the hearing sensitivity of weakfish (*Cynoscion regalis*) and spot. Weakfish were found to detect frequencies up to 2 kHz, while spot detected frequencies only up to 0.7 kHz.

The sciaenid with the greatest hearing sensitivity discovered thus far is the silver perch (*Bairdiella chrysoura*), which has demonstrated auditory thresholds similar to goldfish, responding to sounds up to 4 kHz (Ramcharitar et al. 2004). Silver perch swim bladders have anterior horns that terminate close to the ear. The Ramcharitar et al. (2004) research supports the suggestion that the swim bladder can potentially expand the frequency range of sound detection. Furthermore, Sprague and Luczkovich (2004) calculated silver perch are capable of producing drumming sounds ranging from 128 to 135 decibels (dB). Since drumming sounds are produced by males during courtship, it can be inferred that silver perch detect sounds within this range.

The most widely noted hearing specialists are otophysans (i.e., members of the super order Ostariophysi), which have bony Weberian ossicles (bones that connect the swim bladder to the ear), along which vibrations are transmitted from the swim bladder to the inner ear (Amoser and Ladich 2003). However, only a few otophysans inhabit marine waters. In an investigation of a marine otophysan, the hardhead sea catfish (*Ariopsis felis*), Popper and Tavolga (1981) determined that this species was able to detect sounds from 0.05 to 1 kHz, which is considered a much lower and narrower frequency range than that common to freshwater otophysans (i.e., above 3 kHz) (Ladich and Bass 2003). The difference in hearing capabilities in the respective freshwater and marine catfish appears to be related to the inner ear structure (Popper and Tavolga 1981).

Experiments on marine fish have obtained responses to frequencies between 40 kHz and 180 kHz (University of South Florida 2007). These responses were from several species of the Clupeidae (i.e., herrings, shads, and menhadens) (Astrup 1999); however, not all clupeid species tested have responded and species that can detect these high frequency sounds do not perceive sound equally well at all detectable frequencies. Studies conducted on the following species showed avoidance to sound at frequencies over 100 kHz: alewife (*Alosa pseudoharengus*) (Dunning et al. 1992, Ross et al. 1996), blueback herring (*A. aestivalis*) (Nestler 2002), Gulf menhaden (*Brevoortia patronus*) (Mann et al. 2001) and American shad (*A. sapidissima*) (Popper and Carlson 1998). The highest frequency to solicit a response in any marine fish was 180 kHz for the American shad (Mann et al. 1998, Gregory and Clabburn 2003, Higgs et al. 2004).

Astrup (1999) and Mann et al. (1998) hypothesized that high frequency detecting species may have developed such high sensitivities to avoid predation by odontocetes (i.e., members of the suborder of cetaceans that have teeth). Mann et al. (1998) reported that the American shad can detect sounds from 0.1 to 180 kHz with two regions of best sensitivity: one from 0.2 to 0.8 kHz, and the other from 25 kHz to 150 kHz. The poorest sensitivity was found from 3.2 kHz to 12.5 kHz. The *Alosa* species have relatively low thresholds (about 145 dB re 1 micropascal [µPa]), which should enable the fish to detect odontocete clicks at distances up to about 656 feet (ft) (200 meters [m]) (Mann et al. 1997). For example, echolocation clicks ranging from 200 to 220 dB could be detected by shad with a hearing threshold of 170 dB at distances from 82 to 591 ft (25 to 180 m) (University of South Florida 2007). In contrast, the Clupeidae bay anchovy (*Anchoa mitchilli*), scaled sardine (*Harengula jaguana*), and Spanish sardine (*Sardinella aurita*) did not respond to frequencies over 4 kHz (Gregory and Clabburn 2003, Mann et al. 2001).

Mann et al. (2005) found hearing thresholds (0.1 kHz to 5 kHz) for Pacific herring (*Clupea pallasii*) that were typical of non-high frequency detecting clupeids and that Pacific herring could not detect high frequency signals at received levels up to 185 dB re 1 µPa. Mann et al. (2005) cautioned that an earlier study by Wilson and Dill (2002) seeming to indicate Pacific herring responded to high frequency actually used a broadband sound source that contained less energy above 4 kHz (in the mid-frequency to high frequency range) therefore, it was not clear whether the herring were responding to the higher energy, lower-frequency components of the experiment or to the mid and high frequency.

Although few non-clupeid species have been tested for responses to high frequency sound (Mann et al. 2001), the only other non-clupeid species shown to possibly be able to detect high frequency is the cod (*Gadus morhua*) (Astrup and Mohl 1993). However, in Astrup and Moh's (1993) study it is feasible that the cod was detecting the stimulus using touch receptors that were over driven by very intense fish-finding sonar emissions (Astrup 1999, Ladich and Popper 2004). Nevertheless, Astrup and Mohl (1993) indicated that cod have high frequency thresholds of up to 38 kHz at 185 to 200 dB re 1 µPa, which likely only allows for detection of odontocete's clicks at distances no greater than 33 to 98 ft (10 to 30 m) (Astrup 1999).

As mentioned above, investigations into the hearing ability of marine fishes have most often yielded results exhibiting poor hearing sensitivity. Experiments on elasmobranch fish (i.e., sharks and rays) have demonstrated poor hearing abilities and frequency sensitivity from 0.02 kHz to 1 kHz, with best sensitivity at lower ranges (Casper et al. 2003, Casper and Mann 2006, Myrberg 2001). Though only five elasmobranch species have been tested for hearing thresholds, it is believed that all elasmobranchs will only detect low-frequency sounds because they lack a swim bladder, which resonates sound to the inner ear. Theoretically, fishes without an air-filled cavity are limited to detecting particle motion and not pressure and, therefore have poor hearing abilities (Casper and Mann 2006).

By examining the morphology of the inner ear of bluefin tuna (*Thunnus thynnus*), Song et al. (2006) hypothesized that bluefin tuna probably do not detect sounds too much over 1 kHz (if that high). This research concurred with the few other studies conducted on tuna species. Iversen (1967) found that yellowfin tuna (*T. albacares*) can detect sounds from 0.05 to 1.1 kHz, with best sensitivity of 89 dB (re 1 µPa) at 0.5 kHz. Kawakawa (*Euthynnus affinus*) appear to be able to detect sounds from 0.1 to 1.1 kHz but with best sensitivity of 107 dB (re 1 µPa) at 0.5 kHz (Iversen 1969). Additionally, Popper (1981) looked at the inner ear structure of a skipjack tuna (*Katsuwonus pelamis*) and found it to be typical of a hearing generalist. While only a few species of tuna have been studied, and in a number of fish groups both generalists and specialists exist, it is reasonable to suggest that unless bluefin tuna are exposed to very high intensity sounds from which they cannot swim away, short- and long-term effects may be minimal or nonexistent (Song et al. 2006).

Some damselfish have been shown to be able to hear frequencies of up to 2 kHz, with best sensitivity well below 1 kHz. Egner and Mann (2005) found that juvenile sergeant major damselfish (*Abudefduf saxatilis*) were most sensitive to lower frequencies (0.1 to 0.4 kHz); however, larger fish (greater than 50 millimeters [mm]) responded to sounds up to 1.6 kHz. Still, the sergeant major damselfish is considered to have poor sensitivity in comparison even to other hearing generalists (Egner and Mann 2005). Kenyon (1996) studied another marine generalist, the bicolor damselfish (*Stegastes partitus*), and found the bicolor damselfish responded to sounds up to 1.6 kHz with the most sensitive frequency at 0.5 kHz. Further, larval and juvenile Nagasaki damselfish (*Pomacentrus nagasakiensis*) have been found to hear at frequencies between 0.1 and 2 kHz, however, they are most sensitive to frequencies less than 0.3 kHz (Wright et al. 2005, Wright et al. 2007). Thus, damselfish appear to be primarily generalists with some ability to hear slightly higher frequencies expected of specialists (Popper 2008).

Female midshipman fish apparently use the auditory sense to detect and locate vocalizing males during the breeding season. Interestingly, female midshipman fish go through a shift in hearing sensitivity depending on their reproductive status. Reproductive females showed temporal encoding up to 0.34 kHz, while nonreproductive females showed comparable encoding only up to 0.1 kHz (Sisneros and Bass 2003).

The hearing capability of Atlantic salmon (*Samo salar*), a hearing generalist, indicates a rather low sensitivity to sound (Hawkins and Johnstone 1978). Laboratory experiments yielded responses only to 0.58 kHz and only at high sound levels. Salmon's poor hearing is likely due to the lack of a link between the swim bladder and inner ear (Jorgensen et al. 2004).

Furthermore, investigations into the inner ear structure of fishes belonging to the order Scorpaeniformes have suggested that these fishes have generalist hearing abilities (Lovell et al. 2005). Although an audiogram (which provides a measure of hearing sensitivity) has yet to be performed, the lack of a swimbladder is indicative of these species having poor hearing ability (Lovell et al. 2005). However, studies of the leopard robin (*Prionotus scitulus*), another species in this order that do contain swim bladders, indicated that they are hearing generalists as well (Tavolga and Wodinski 1963), which makes extrapolation on hearing from this species to all members of the group very difficult to do (Popper 2008).

3.6.1.5 Current Requirements and Practices

Mitigation measures, implemented for marine mammals and sea turtles, also offer protections to habitats associated with fish communities. Mitigation is discussed in more detail in Chapter 5.

3.6.2 Environmental Consequences

As noted in Section 3.6.1, the ROI for fish is the GOA TMAA, which is more than 12 nm (22 km) from the closest point of land. As such, this section distinguishes between U.S. territorial seas (shoreline to 12 nm) and nonterritorial seas, (seaward of 12 nm) for the purposes of applying the appropriate regulations (National Environmental Policy Act [NEPA] or Executive Order [EO] 12114) to analyze potential

environmental effects. Environmental effects in the open ocean beyond the U.S. territorial seas are analyzed in this EIS/OEIS pursuant to EO 12114.

3.6.2.1 Regulatory Framework

The primary laws that make up the regulatory framework for fish and EFH include the MSFCMA and the ESA. These, along with other applicable laws, are briefly described below:

Magnuson-Stevens Fishery Conservation and Management Act

The NPFMC manages the groundfish fisheries, while management of the salmon fisheries is deferred to the State of Alaska. All waters that support anadromous fish are considered EFH by NMFS (NPFMC 2008), while EFH for groundfish varies by species. Federal agencies are required to consult with NMFS and to prepare an EFH Assessment if potential adverse effects on EFH are anticipated from their activities. An EFH Assessment has been prepared for the TMAA.

Sustainable Fisheries Act

In 1996 (later amended in 2002 and 2006), the MSFCMA was reauthorized and amended by the Sustainable Fisheries Act (SFA). The SFA provides a new habitat conservation tool in the form of the EFH mandate. The EFH mandate requires that the regional FMCs, through federal FMP, describe and identify EFH for each federally managed species, minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitats. Authority to implement the SFA is given to the Secretary of Commerce through the NMFS. The SFA requires that the EFH be identified and described for each federally managed species. The SFA requires federal agencies to consult with the NMFS on activities that may adversely affect EFH. For actions that affect a threatened or endangered species, its critical habitat, and its EFH, federal agencies must initiate ESA and EFH consultations. Adverse effects mean any impact that reduces quality and/or quantity of EFH. Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 C.F.R. 600.810[a]).

Endangered Species Act

The ESA (16 U.S.C. §§ 1531 to 1543) established protection over and conservation of threatened and endangered species. The ESA applies to federal actions in two separate respects: the ESA requires that federal agencies, in consultation with the responsible wildlife agency, ensure that Proposed Actions are not likely to jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of a critical habitat. Regulations implementing the ESA expand the consultation requirement to include those actions that "may affect" a listed species or adversely modify critical habitat.

If an agency's Proposed Action would take a listed species, the agency must obtain an incidental take statement from the responsible wildlife agency. The ESA defines the term "take" to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt any such conduct."

Executive Order 12962

EO 12962 on Recreational Fisheries (60 Federal Register [FR] 30769) was enacted in 1995 to ensure that federal agencies strive to improve the "quantity, function, sustainable productivity, and distribution of U.S. aquatic resources" so that recreational fishing opportunities nationwide can increase. The primary goal of this order is to promote the conservation, restoration, and enhancement of aquatic systems and fish

populations by increasing fishing access, education and outreach, and multiagency partnerships. The National Recreational Fisheries Coordination Council, co-chaired by the Secretaries of the Interior and Commerce, is charged with overseeing federal actions and programs that are mandated by this order.

Northern Pacific Halibut Act

The Northern Pacific Halibut Act of 1982 (16 U.S.C. §§ 773-773k) calls for the United States and Canada to implement the 1979 Protocol for the Preservation of the Halibut Fishery of the Northern Pacific Ocean and the Bering Sea. The Act provides for the appointment of U.S. Commissioners to the International Pacific Halibut Commission. In addition, the Act authorizes the NPFMC to develop regulations to limit access and govern the Pacific halibut catch in waters off Alaska. All Council action must be approved and implemented by the U.S. Secretary of Commerce.

National Fishery Enhancement Act

In 1984, Congress passed the National Fishery Enhancement Act (NFEA) (33 U.S.C. §§ 2101 et seq.) in recognition of the social and economic value of artificial reefs in enhancing fishery resources. Under this act, the Secretary of Commerce and the U.S. Army Corps of Engineers are charged with the responsibility for encouraging and regulating artificial reefs in the navigable waters of the United States. One of the primary directives of the NFEA was the preparation of a long-term National Artificial Reef Plan (33 U.S.C. §§ 2103).

Pacific Salmon Treaty

The Pacific Salmon Treaty (PST) of 1985 (16 U.S.C. §§ 3631 et seq.) was established between Canada and the United States to establish a framework for managing salmon populations between the two countries. The Treaty principles were to (a) prevent overfishing and provide for optimum production; and (b) provide equivalent production benefits from salmon originating from the respective country's waters. The Treaty requires the United States and Canada to meet international conservation and allocation objectives by taking into account ways of reducing interceptions and avoiding disruption of existing fisheries and stock abundances.

This Treaty also called for the establishment of the Pacific Salmon Commission (PSC), to oversee the implementation of the Treaty. The PSC is composed of representatives of both countries to provide regulatory and technical advice. Fisheries regulation is a shared responsibility of the United States and Canada.

On June 30, 1999, the following PST provisions were implemented: (a) establish abundance-based fishing regimes for Pacific salmon fisheries under the jurisdiction of the PSC; (b) create two bilaterally based funds to promote cooperation, improve fishery management, and aid stock and habitat enhancement. Additionally, the PST includes provisions to enhance bilateral cooperation, improve the scientific basis for salmon management, and apply institutional changes to the PSC.

3.6.2.2 Approach to Analysis

This section describes potential environmental effects on fish associated with conducting naval activities for three alternative scenarios in the TMAA. The activities include active sonar activities; surface vessel, submarine, and aircraft warfare training activities; weapons firing; explosives ordnance use; nonexplosives ordnance use; electronic combat; and discharges of expendable materials. These activities are configured in various combinations to define seven warfare areas, as previously described in Chapter 2.

The effects on fish could include direct physical injury, such as potential for death, injury, or failure to (or an increase in the time needed to) reach the next developmental stage. Potential effects on fish eggs, larvae, and adult fish were evaluated in the analysis and results presented in the following subsections. In

addition, a review of the literature regarding potential effects on fish common to most activities is presented. These include warfare areas and environmental stressors, acoustic effects of underwater sounds to fish, effects of underwater impulsive sounds, explosive ordnance, nonexplosive ordnance, and expended materials.

Data Sources

A comprehensive and systematic review of relevant literature and data has been conducted in order to complete this analysis for fish and EFH. Of the available scientific literature (both published and unpublished), the following types of documents were utilized in the assessment: journals, books, periodicals, bulletins, Department of Defense (DoD) operations reports, EISs, and other technical reports published by government agencies, private businesses, consulting firms, or nongovernmental conservation organizations. The scientific literature was also consulted during the search for geographic location data on the occurrence of resources within the TMAA. The primary sources of information used to describe the affected environment for fish and EFH was the U.S. Pacific Fleet Marine Resource Assessment (MRA) for the GOA Operating Area (Department of Navy [DoN] 2006). The MRA report provides compilations of the most recent data and information on the occurrence of marine resources in the TMAA.

Assessment Methods

Impact Thresholds

This EIS/OEIS analyzes potential effects to fish and EFH in the context of the MSFCMA (federally managed species and EFH), ESA (species listed under the ESA only), and EO 12114. The factors used to assess the significance of effects vary under these Acts. Pursuant to 50 CFR 600.910(a), an "adverse effect" on EFH is defined as any impact that reduces the quality and/or quantity of EFH (NMFS 2004a, 2004b). To help identify Navy activities that may reduce the quality and/or quantity of EFH and fall within the adverse effect definition, the Navy has determined that temporary or minimal impacts are not considered to "adversely affect" EFH. The MSFCMA EFH regulations (50 CFR 600.815[a][2][ii]) and the EFH Final Rule (67 Fed. Reg. 2354) were used as guidance for this determination, as they highlight activities with impacts that are more than minimal and not temporary in nature, as opposed to those activities resulting in inconsequential changes to habitat[1]. Temporary effects are those that are limited in duration and allow the particular environment to recover without measurable impact (67 Fed. Reg. 2354). Minimal effects are those that may result in relatively small changes in the affected environment and insignificant changes in ecological functions (67 Fed. Reg. 2354). Whether an impact is minimal depends on a number of factors[2]:

- The intensity of the impact at the specific site being affected;
- The spatial extent of the impact relative to the availability of the habitat type affected;
- The sensitivity/vulnerability of the habitat to the impact;
- The habitat functions that may be altered by the impact (e.g., shelter from predators); and

[1] While the "more than minimal and not temporary" criteria referenced in the EFH regulations is specific to assessing impacts on EFH from fishing activities, in the absence of similar guidance/criteria for assessing nonfishing impacts on EFH, the same criteria will be used for determining whether Navy's non-fishing impacts reduce the quality and/or quantity of EFH.

[2] NMFS. 2002. Considerations for Conducting a Thorough Analysis of Options to Minimize the Adverse Effects of Fishing on EFH. Available at:
http://www.nmfs.noaa.gov/habitat/habitatprotection/pdf/efh/fishmgmt/fishing_impacts_considerations_final.pdf

- The timing of the impact relative to when the species or life stage needs the habitat.

The factors outlined above were also considered in determining the significance of effects under EO 12114. For purposes of ESA compliance, effects of the action were analyzed to make the Navy's determination of effect for listed species. The definitions used in making the determination of effect under Section 7 of the ESA are based on the USFWS and NMFS *Endangered Species Consultation Handbook* (USFWS 1998).

Warfare Areas and Associated Environmental Stressors

The Navy used a screening process to identify aspects of the Proposed Action that could act as stressors to fish and EFH. Navy subject matter experts de-constructed the warfare areas and activities included in the Proposed Action to identify specific activities that could act as stressors. Public and agency scoping comments, previous environmental analyses, previous agency consultations, laws, regulations, EOs, and resource-specific information were also evaluated. This process was used to focus the information presented and analyzed in the affected environment and environmental consequences sections of this EIS/OEIS. Potential stressors to fish and EFH include vessel movements (disturbance and collisions), aircraft overflights (disturbance), explosive ordnance, sonar training (disturbance), weapons firing/nonexplosive ordnance use (disturbance and strikes), and expended materials (ordnance-related materials, targets, sonobuoys, and marine markers).

Acoustic Effects of Underwater Sounds to Fish

There have been very few studies on the effects that human-generated sound may have on fish; these have been reviewed in a number of places (e.g., NRC, 1994, 2003, Popper 2003, Popper et al. 2004, Hastings and Popper 2005, Popper 2008, Popper and Hastings 2009), and some more recent experimental studies have provided additional insight into the issues (e.g., Doksæter et al. 2009, Govoni et al. 2003, McCauley et al. 2003, Popper et al. 2005, 2007). Most investigations, however, have been in the gray literature (non peer-reviewed reports – see Hastings and Popper 2005, Popper 2008, and Popper and Hastings 2009) for extensive critical reviews of this material). While some of these studies provide insight into effects of sound on fish, the majority of the gray literature studies often lack appropriate controls, statistical rigor, and/or expert analysis of the results.

There are a wide range of potential effects on fish that range from no effect at all (e.g., the fish does not detect the sound or it "ignores" the sound) to immediate mortality. In between these extremes are a range of potential effects that parallel the potential effects on marine mammals that were illustrated by Richardson et al. (1995). These include, but may not be limited to:

- No effect behaviorally or physiologically: The animal may not detect the signal, or the signal is not one that would elicit any response from the fish.
- Small and inconsequential behavioral effects: Fish may show a temporary "awareness" of the presence of the sound but soon return to normal activities.
- Behavioral changes that result in the fish moving from its current site: This may involve leaving a feeding or breeding ground. Some behavioral changes can result in lost feeding or reproduction opportunities, or make fish vulnerable to other stressors in the environment such as the presence of predators. This effect may be temporary, in that the fish return to the site after some period of time (perhaps after a period of acclimation or when the sound terminates), or permanent.
- Temporary loss of hearing (often called Temporary Threshold Shift – TTS): This recovers over minutes, hours, or days.

- Physical damage to auditory or nonauditory tissues (e.g., swim bladder, blood vessels, brain): The damage may be only temporary, and the tissue "heals" with little impact on fish survival, or it may be more long term, permanent, or may result in death. Death from physical damage could be a direct effect of the tissue damage or the result of the fish being more subject to predation than a healthy individual.

Studies on effects on hearing have generally been of two types. In one set of studies, the investigators exposed fish to long-term increases in background sound to determine if there are changes in hearing, growth, or survival of the fish. While data are limited to a few freshwater species, it appears that some increase in ambient sound level, even to above 170 dB re 1 µPa, does not permanently alter the hearing ability of the hearing generalist species studied, even if the increase in sound level is for an extended period of time. However, this may not be the case for all hearing generalists, though it is likely that any temporary hearing loss in such species would be considerably less than for specialists receiving the same sound exposure. It is critical to note that more extensive data are needed on additional species, and if there are places where the ambient levels exceed 170 to 180 dB, it would be important to do a quantitative study of effects of long-term sound exposure at these levels. It is also clear that there is a larger temporary hearing loss in hearing specialists. Again, however, extrapolation from the few freshwater species to other species (freshwater or marine) must be done with caution until there are data for a wider range of species, and especially species with other types of hearing specializations than those found in the species studied to date (all of which are otophysan fishes and have the same specializations to enhance hearing).

In the second type of studies, fish were exposed to short duration but high intensity signals such as might be found near a high intensity sonar, pile driving, or seismic air gun survey. The investigators in such studies were examining whether there was not only hearing loss and other long-term effects, but also short-term effects that could result in death to the exposed fish. Because study results vary, it is difficult to speculate why there are many differences in the studies, including species, precise sound source, and spectrum of the sound (Popper 2008, Popper and Hastings 2009).

One study tested effects of seismic air guns, a highly impulsive and intense sound source. This study demonstrated differences in the effects of air guns on the hearing thresholds of different species. In effect, these results substantiate the argument made by Hastings et al. (1996) and McCauley et al. (2003) that it is difficult to extrapolate between species with regard to the effects of intense sounds.

Another study examined the effects of Surveillance Towed Array Sensor System Low-Frequency Active (SURTASS LFA) sonar; this study determined there was no effect on ear tissue (Popper et al. 2007).

Other earlier studies suggested that there may be some loss of sensory hair cells due to high intensity sources. However, these studies did not concurrently investigate effects on hearing or nonauditory tissues (Enger 1981, Hastings et al. 1996). In neither study was the hair cell loss more than a relatively small percent of the total sensory hair cells in the hearing organs (Popper 2008).

Effects of Underwater Impulsive Sounds

Air gun studies on very few species resulted in a small hearing loss in several species, with complete recovery within 18 hours (Popper et al. 2005). Other species showed no hearing loss with the same exposure. There appeared to be no effects on the structure of the ear, and a limited examination of nonauditory tissues, including the swim bladder, showed no apparent damage (Popper et al. 2005). One other study of effects of an air gun exposure showed some damage to the sensory cells of the ear (McCauley et al. 2003); it is difficult to differentiate these two studies. However, the two studies employed different methods of exposing fish, and used different species. Other studies have demonstrated some behavioral effects on fish during air gun exposure used in seismic exploration (e.g., Pearson et al.

1987, 1992, Engås et al. 1996, Engås and Løkkeborg 2002, Slotte et al. 2004), but the data are limited and it would be very difficult to extrapolate to other species, as well as to other sound sources.

Explosive Sources

A number of studies have examined the effects of explosives on fish; these are reviewed in detail in Hastings and Popper (2005). However, these studies are often variable, so extrapolation from one study to another, or to other sources, such as those used by the Navy, is not really possible. While many of these studies show that fish are killed if they are near the source, and there are some suggestions that there is a correlation between size of the fish and death (Yelverton et al. 1975), little is known about the very important issues of nonmortality damage in the short- and long-term, and nothing is known about effects on behavior of fish.

The major issue in explosives is that the gas oscillations induced in the swim bladder or other air bubble in fishes caused by high sound pressure levels can potentially result in tearing or rupturing of the chamber. This has been suggested to occur in some (but not all) species in several gray literature unpublished reports on effects of explosives (e.g., Aplin 1947, Coker and Hollis 1950, Gaspin 1975, Yelverton et al. 1975), whereas other published studies do not show such rupture (e.g., the peer reviewed study by Govoni et al. 2003). Key variables that appear to control the physical interaction of sound with fishes include the size of the fish relative to the wavelength of sound, mass of the fish, anatomical variation, and location of the fish in the water column relative to the sound source (e.g., Yelverton et al. 1975, Govoni et al. 2003).

Explosive blast pressure waves consist of an extremely high peak pressure with very rapid rise times (< 1 millisecond [ms]). Yelverton et al. (1975) exposed eight different species of freshwater fish to blasts of 1-pound (lb) spheres of Pentolite (high explosive) in an artificial pond. The test specimens ranged from 0.02 grams (g) (guppy) to 744 g (large carp) body mass and included small and large animals from each species. The fish were exposed to blasts having extremely high peak overpressures with varying impulse lengths. The investigators found what appears to be a direct correlation between body mass and the magnitude of the "impulse," characterized by the product of peak overpressure and the time it took the overpressure to rise and fall back to zero (units in pounds per square inch (psi)-ms), which caused 50 percent mortality (see Hastings and Popper 2005 for detailed analysis).

One issue raised by Yelverton et al. (1975) was whether there was a difference in lethality between fish which have their swim bladders connected by a duct to the gut and fish which do not have such an opening. The issue is that it is possible that a fish with such a connection could rapidly release gas from the swim bladder on compression, thereby not increasing its internal pressure. However, Yelverton et al. (1975) found no correlation between lethal effects on fish and the presence or lack of connection to the gut.

While these data suggest that fishes with both types of swim bladders are affected in the same way by explosive blasts, this may not be the case for other types of sounds, and especially those with longer rise or fall times that would allow time for a biomechanical response of the swim bladder (Hastings and Popper 2005). Moreover, there is some evidence that the effects of explosives on fishes without a swim bladder are less than those on fishes with a swim bladder (e.g., Gaspin 1975, Goertner et al. 1994, Keevin et al. 1997). Thus, if internal damage is, even in part, an indirect result of swim bladder (or other air bubble) damage, fishes without this organ may show very different secondary effects after exposure to high sound pressure levels. Still, it must be understood that the data on effects of impulsive sources and explosives on fish are limited in number and quality of the studies, and in the diversity of fish species studied. Thus, extrapolation from the few studies available to other species or other devices must be done with the utmost caution.

In a more recent published report, Govoni et al. (2003) found damage to a number of organs in juvenile pinfish (*Lagodon rhomboids*) and spot (*Leiostomus xanthurus*) when they were exposed to underwater detonations at a distance of 11.8 ft (3.6 m), and most of the effects, according to the authors, were sublethal. Effects on other organ systems that would be considered irreversible (and presumably lethal) only occurred in a small percentage of fish exposed to the explosives. Moreover, there was virtually no effect on the same sized animals when they were at a distance of 24.6 ft (7.5 m), and more pinfish than spot were affected.

Based upon currently available data it is not possible to predict specific effects of Navy impulsive sources on fish. At the same time, there are several results that are at least suggestive of potential effects that result in death or damage. First, there are data from impulsive sources such as pile driving and seismic air guns that indicate that any mortality declines with distance, presumably because of lower signal levels. Second, there is also evidence from studies of explosives (Yelverton et al. 1975) that smaller animals are more affected than larger animals. Finally, there is also some evidence that fish without an air bubble, such as flatfish and sharks and rays, are less likely to be affected by explosives and other sources than are fish with a swim bladder or other air bubble.

Yet, as indicated for other sources, the evidence of short- and long-term behavioral effects, as defined by changes in fish movement, etc., is nonexistent. Thus, it is unknown if the presence of an explosion or an impulsive source at some distance, while not physically harming a fish, will alter its behavior in any significant way.

Expended Materials

Falling Material and Small-Arms Rounds

Inert bombs, intact missiles, and targets could impact the water with great force and produce a large impulse and loud sound. Physical disruption of the water column by the shock wave and bubble pulse is a localized, temporary effect, and would be limited to within tens of meters of the impact area and would persist for a matter of minutes. Large objects hitting the water produce sounds with source levels on the order of 240 to 271 dB re 1 µPa and pulse durations of 0.1 to 2 ms, depending on the size of the object (McLennan 1997). Physical and chemical properties of seawater would be temporarily affected (e.g., increased oxygen concentrations due to turbulent mixing with the atmosphere), but there would be no lasting adverse effect on the water column habitat from this physical disruption. Given the size of the TMAA, the infrequency of the activities, and the distribution of fish species, a remote possibility exists that some individual fish at or near the surface may be directly impacted (i.e., direct strike) if they are in the target area at the point of physical impact at the time of nonexplosive ordnance delivery. Therefore, effects of shock waves from inert bombs and intact missiles and targets hitting the water surface on fish are expected to be localized and minimal.

However, most missiles hit their target or are disabled before hitting the water. Thus, most of these missiles and aerial targets hit the water as fragments, which quickly dissipate their kinetic energy within a short distance from the surface. Similarly, expended small-arms rounds may also strike the water surface with sufficient force to cause injury. Most fish swim some distance below the surface of the water. Therefore, fewer fish are exposed to mortality from falling fragments whose effects are limited to the near surface, than mortality from intact missiles and targets whose effects can extend well below the water surface.

Munitions Constituents

Munitions constituents can be released from sonobuoys, targets, torpedoes, missiles, aerial targets, and at sea explosions. Petroleum hydrocarbons released during an accident are harmful to fish. Jet fuel is toxic to fish but floats and vaporizes very quickly. Assuming that a target disintegrates on contact with the water,

any residual unburned fuel may be spread over a large area and dissipate quickly. In addition, fuel spills and material released from weapons and targets could occur at different locations and at different times.

Potential impacts from Navy explosives training include degradation of substrate and introduction of toxic chemicals into the water column. Combustion products from the detonation of high explosives—carbon monoxide (CO), carbon dioxide (CO_2), hydrogen (H_2), water (H_2O), nitrogen (N_2), and ammonia (NH_3)—are commonly found in sea water. The primary constituents that would be released from explosives training are nitroaromatic compounds such as trinitrotoluene (TNT), cyclonite (Royal Demolition Explosive or RDX), and octogen (High Melting Explosive or HMX) (URS 2000). Initial concentrations of explosion by-products are not expected to be hazardous to marine life (DoN 2001) and would not accumulate in the training area because exercises are spread out over time and the chemicals disperse in the ocean. The water quality effects of the explosions would be infrequent, temporary, and localized, and would have no long-term adverse effect on water quality. Effects on marine fish associated with the release of munitions constituents and other materials are expected to be minimal.

3.6.2.3 No Action Alternative

Under the No Action Alternative, baseline levels of activities would remain unchanged from current conditions. Fish would have the potential to be affected by vessel movement, aircraft overflights, explosive ordnance, nonexplosive ordnance use, weapons firing disturbance, and expended materials.

Vessel Movements

Many of the ongoing and proposed activities within the TMAA involve maneuvers by various types of surface vessels, most of which use propellers for propulsion. When moving, vessels generally displace water from the hull, and an even greater volume from propeller wash. Currently, approximately four Navy vessels will be operating in the TMAA, but the number can vary based on training schedules and scenarios. Activities involving vessel movements occur intermittently and are short in duration, generally a few hours in duration. These activities are widely dispersed throughout the TMAA, which is a vast area encompassing 42,146 square nm (nm^2) (144,557 square km [km^2]) of surface/subsurface ocean.

Vessel movements have the potential to expose fish to sound and general disturbance, which could result in short-term behavioral and/or physiological responses (swimming away, increased heart rate). Such responses would not be expected to compromise the general health or condition of individual fish. The probability of collisions between vessels and adult fish, which could result in injury or mortality, would be extremely low because this life stage is highly mobile and Navy vessel density in the TMAA is low. Vessel movements would result in short-term and localized disturbances to the water column, but benthic habitats would not be affected. Ichthyoplankton (fish eggs and larvae) in the upper portions of the water column could be displaced, injured, or killed by vessel and propeller movements. However, no measurable effects on fish recruitment would occur because the number of eggs and larvae exposed to vessel movements would be low relative to total ichthyoplankton biomass. Vessel movements under the No Action Alternative would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from vessel movements in nonterritorial seas would be minimal under the No Action Alternative.

Aircraft Overflights

Aircraft overflights produce airborne sound and some of this energy would be transmitted into the water. However, sound does not transmit well from air to water. Predicted sound levels resulting from HC-130 aircraft flying at 1,000 ft (305 m) and 250 ft (76 m) were 110 and 121 dB re 1 µPa, respectively, directly under the flight path at a depth of 1 ft (maximum one-third octave level for frequencies 20 hertz [Hz]–5 kHz). The same sound levels resulting from an HH-60 helicopter flying at 1,000 ft (305 m), flying at 100 ft (30 m), and hovering 10 ft (3 m) were 110, 129, and 143 dB re 1 µPa (respectively) directly under the

helicopter at a depth of 1 ft (0.3 m) (USAF 1999). The sound levels would decline at increasing lateral distances from the aircraft's track or location and with increasing depth in the water, and the underwater sounds originating from the aircraft would decline rapidly after the aircraft has passed. It is unlikely that these sound levels would cause physical damage or even behavioral effects in fish based on the sound levels that have been found to cause such effects. In addition to sound, helicopters flying at low levels can create a vertical down wash of air (rotor wash) that becomes a surface wind, which may disturb the water surface below the aircraft and displace any fishes in the general vicinity.

Such responses would not compromise the general health or condition of individual fish. Aircraft overflights under the No Action Alternative would not result in adverse effects to fish populations or EFH as defined under MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from aircraft overflight movements in nonterritorial seas under the No Action Alternative would be minimal.

Explosive Ordnance

Explosions that occur under the No Action Alternative in the TMAA are associated with training exercises that use explosive ordnance, including bombs (BOMBEX), missiles (MISSILEX), and naval gun shells (GUNEX), 5-inch (in) high explosive rounds (see Table 3.6-8 for number of explosive ordnance expended annually for all Alternatives). Potential effects of explosive charge detonations on fish and EFH include disruption of habitat; exposure to chemical by-products; disturbance, injury, or death from the shock (pressure) wave; acoustic impacts; and indirect effects including those on prey species and other components of the food web.

Concern about potential fish mortality associated with the use of at-sea explosives led military researchers to develop mathematical and computer models that predict safe ranges for fish and other animals from explosions of various sizes (e.g., Yelverton et al. 1975, Goertner 1982, Goertner et al. 1994). Young's (1991) equations for 90-percent survivability were used to estimate fish mortality in the Seawolf Shipshock Trial EIS (DoN 1998). In that document, Yelverton's (1981) equations were used to predict survival of fish with swim bladders, although the equations apply to simple explosives, and may not apply to all the explosives used in the TMAA. The impulse levels that kill or damage fish with swim bladders have been determined empirically to be as follows (from Yelverton 1981):

- 50 percent Mortality $\ln(I)=3.6136 + 0.3201 \ln(M)$
- 1 percent Mortality $\ln(I)=3.0158 + 0.3201 \ln(M)$
- No Injuries $\ln(I)=2.0042 + 0.3201 \ln(M)$

Where I = impulse (in Pascal•seconds or Pa•s) and M = body mass of a fish (g) with a swim bladder.

Yelverton (1981) cautioned against using these equations for fish weighing more than a few kg because fish used in the experiments from which these equations were derived did not weigh more than 2.2 lb (1 kg). Young's parameters include the size of the fish and its location relative to the explosive source, but are independent of environmental conditions (e.g., depth of fish and explosive shot frequency). An example of such model predictions is shown in Table 3.6-5, which provides the radius of effect of various charges, depths, and fish size. The 10-percent mortality range is the distance beyond which 90 percent of the fish present would be expected to survive.

Table 3.6-5: Range of Effects for at-Sea Explosions

Charge	Charge Depth	Effect Criterion	Range of Effect
1 lb	9.8 ft (3.0 m)	10% Mortality	338 ft (103 m) for 1-ounce fish 180 ft (55 m) for 1-pound. fish 89 ft (27 m) for 30-pound fish
10 lbs	125 ft (38 m)	10% Mortality	656 ft (200 m) for 1-ounce fish 423 ft (129 m)s for 1-pound fish 259 ft (79 m) for 30-pound fish
20 lbs	62 ft (19 m)	10% Mortality	856 ft (261 m) for 1-ounce fish 554 ft (169 m) for 1-pound fish 348 ft (106 m) for 30-pound fish
20 lbs	125 ft (38 m)	10% Mortality	928 ft (283 m) for 1-ounce fish 597 ft (182 m) for 1-pound fish 364 ft (111 m) for 30-pound fish

Typically, BOMBEX at sea involve one or more aircraft bombing a target simulating a hostile surface vessel. Practice bombs entering the water would be devoid of combustion chemicals found in the warheads of explosive bombs, and would generate physical shock entering the water, but would not explode. After sinking to the bottom, the physical structure of bombs would be incorporated into the marine environment by natural encrustation and/or sedimentation (discussed later in Expended Materials Section). Air-to-ground bombing using explosive ordnance is mostly conducted on land ranges which are outside the scope of the ROI; however, some live bombs may be dropped at sea (see Table 3.6-8 for number of explosive ordnance expended annually for all Alternatives).

As with underwater detonations, the range within which fish may sustain injury or death from an exploding bomb would depend on environmental parameters, the size, location, and species of the fish, and its internal anatomy (e.g., whether it has a swim bladder) (DoN 2005). Fish without swim bladders are far more resistant to explosions than those with swim bladders (Keevin and Hempen 1997). Explosive bombs will be fused to detonate on contact with the water and it is estimated that 99 percent of them will explode within 5 ft (1.5 m) of the ocean surface (DoN 2005). Table 3.6-6, based on Young's (1991) model, displays 10-percent mortality (90-percent survival) ranges for the largest explosive bombs that may be deployed during at-sea exercises.

Table 3.6-6: Estimated Fish-Effects Ranges for Explosive Bombs

Warhead Weight NEW (lb-TNT)	10% Mortality Range by Weight of Fish		
	1 ounce	1 pound	30 pounds
500 lbs	1,289 ft (393 m)	899 ft (274 m)	578 ft (176 m)
1,000 lbs	1,343 ft (409 m)	937 ft (286 m)	602 ft (184 m)
2,000 lbs	1,900 ft (579 m)	1,325 ft (404 m)	852 ft (260 m)

Note: NEW = Net Explosive Weight

Potential effects from the use of Naval gun systems have been analyzed in a variety of environmental documents (DoN 2000, 2001b, 2002, 2004, 2007). The 5-inch gun has the largest warhead fired during routine gunnery exercises. Most training uses nonexplosive 5-in rounds. The surface area of the ocean impacted by a nonexplosive 5-in round has been estimated to be 20 square in (in^2) (129 square cm [cm^2]) (DoN 2007). Considering the vast expanse of the TMAA, few fish would be directly struck by a shell from a 5-in gun.

Explosive rounds would have the greatest potential for impacts to fish in surface waters. As previously indicated, biological effects of at sea explosions depend on many factors, including the size, type, and depth of both the animal and the explosive, the depth of the water column, the standoff distance from the charge to the animal, and the sound-propagation properties of the environment. Potential impacts can range from brief acoustic effects, tactile perception, and physical discomfort, to slight injury to internal organs and the auditory system, to death of the animal (Keevin and Hempen 1997).

Table 3.6-7 provides an estimation of the potential range of lethal effects on swim bladder fish based on Young's (1991) model for five-in explosive projectiles. These rounds have a Net Explosive Weight (NEW) of TNT of approximately 8 lb (3.6 kg) and are assumed to detonate at a depth of 5 ft (1.3 m). Behavioral reactions of fish would extend over a substantially larger area. The overall impacts to water-column habitat would, however, be minor as fish would return following the activity. The abundance and diversity of fish and the quality and quantity of fish habitat within the range is unlikely to decrease as a result of gun fire training.

Table 3.6-7: Estimated Fish-Effects Ranges for 5-in Naval Gunfire Rounds

Weight of Fish	10% Mortality Range	
	feet	meters
1 ounce (28 g)	405	123
1 lb (0.4 kg)	282	86
30 lbs (13.6 kg)	181	55

Impacts to fish under the No Action Alternative from explosions would be possible, but these elements of the action are not expected to have measurable or detectable impacts to fish given the vast area encompassing the TMAA (42,146 nm^2 [144,557 km^2]); further reduced using conservative estimates assuming that activities occur across 20 percent of the TMAA (Table 3.6-8). While serious injury and/or mortality to individual fish would be expected if they were present in the immediate vicinity of explosive ordnance use, explosions under the No Action Alternative would not result in impacts to fish populations based on the low number of fish, in relation to the size of the population that would be affected. Disturbances to the water column would be short-term and localized, while disturbance to benthic habitats from explosions would be unlikely due to the water depth where training activities occur. Habitat disturbance and fish injury and mortality from explosions are reduced by Navy mitigation measures, as discussed in Chapter 5. Explosive ordnance under the No Action Alternative would not result in adverse effects to fish populations or EFH as defined under MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from explosive ordnance use in nonterritorial seas would be minimal under the No Action Alternative.

Weapons Firing Disturbance

When a gun is fired from a surface ship, a blast wave propagates away from the gun muzzle. When the blast wave meets the water, most of the energy is reflected back into the air, but some energy is transmitted into the water. A series of pressure measurements were taken during the firing of a 5-in gun aboard the *USS Cole* in June 2000 (Dahlgren 2000). The average peak pressure measured was about 200 dB re 1 µPa at the point of the air and water interface. Down-range peak pressure level, estimated for spherical spreading of the sound in water**,** would be 160 dB re 1 µPa at 328 ft (100 m) and 185 dB re 1 µPa at ~18 ft (5.5 m). The resulting ensonified areas (semi-circles with radius 328 ft [100 m] and 18 ft [5.5 m]) would be 0.004 nm^2 (0.015 km^2) and ~60 yd^2 (50 m^2), respectively.

Table 3.6-8: Number of Explosive Ordnance Expended Annually in 20% of the TMAA for the No Action Alternative, Alternative 1, and Alternative 2

Ordnance	No Action Alternative		Alternative 1			Alternative 2		
	Number	Number per nm^2 (km^2)*	Number	% Increase from No Action	Number per nm^2 (km^2)*	Number	% Increase from No Action	Number per nm^2 (km^2)*
Bombs	48	0.006 (0.002)	72	50%	0.009 (0.002)	166	246%	0.017 (0.005)
Naval Gunshells (5-inch/76 mm)	40	0.005 (0.001)	56	40%	0.007 (0.002)	112	180%	0.013 (0.004)
IEER Sonobuoys	0	0	40	NA	0.005 (0.001)	80	NA	0.009 (0.003)
SINKEX	0	0	0	NA	0	858	NA	0.102 (0.030)
Total	**88**	0.010 (0.003)	**168**	**91%**	0.020 (0.006)	**1,194**	**1,257%**	0.142 (0.041)

*Total may vary due to rounding.

Because effects to fish can occur from impulsive sounds greater than 180 dB (Popper et al. 2005), only those in the immediate vicinity (0.004 nm^2 [0.015 km^2] area) would be affected and effects would be limited to short-term, transitory alarm or startle responses. Since activities are infrequent (see Table 3.6-8) and widely dispersed throughout the TMAA, weapons firing under the No Action Alternative would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. Furthermore, harm to fish populations or habitat from weapons firing disturbance movements in nonterritorial seas would be minimal in accordance with EO 11214.

Expended Materials

The Navy uses a variety of expended materials during training exercises conducted in the TMAA. The types and quantities of expended materials used and information regarding fate and transport of these materials within the marine environment are summarized in Table 3.6-9, and are discussed in Sections 3.2 (Expended Materials) and 3.3 (Water Resources). The analyses presented in these sections predict that the majority of the expended materials would rapidly sink to the sea floor, become encrusted by natural processes, and incorporated into the sea floor, with no significant accumulations in any particular area and no significant negative effects to water quality or marine benthic communities.

Nonexplosive Ordnance

Current Navy training activities in the TMAA such as MISSILEX, BOMBEX, and GUNEX include firing a variety of weapons and employ a variety of nonexplosive training rounds, including bombs, naval gun shells, cannon shells, and small caliber ammunition. These materials are used in the TMAA located in the open ocean beyond 20 nm (37 km). Direct ordnance strikes from firing weapons are potential stressors to fish.

Table 3.6-9: Expended Training Materials in the TMAA – All Alternatives

	No Action Alternative	Alternative 1		Alternative 2	
Training Material	Number	Number	% Increase from No Action	Number	% Increase from No Action
Bombs	120	180	50%	360	200%
Missiles	22	33	50%	66	200%
Targets and Pyrotechnics	252	322	28%	644	160%
Naval Gunshells	10,564	13,188	25%	26,376	150%
Small Caliber Rounds	5,000	5,700	14%	11,400	128%
Sonobuoys	24	793	3,204%	1,587	6,513%
PUTR	0	7	NA	7	NA
SINKEX	0	0	NA	858	NA
Total	**15,982**	**20,223**	**26%**	**41,298**	**160%**
Number per nm^2 (km^2) within 20% of TMAA	**1.9 (0.5)**	**2.4 (0.7)**		**4.9 (1.4)**	

Nonexplosive bombs and intact targets could impact the water with great force and produce a large impulse and loud sound. Physical disruption of the water column by the shock wave and bubble pulse is a localized, temporary effect, and would be limited to within tens of meters of the impact area and persist for a matter of minutes. Physical and chemical properties would be temporarily affected (e.g., increased oxygen concentrations due to turbulent mixing with the atmosphere), but there would be no lasting adverse effect on the water column habitat from this physical disruption.

Large objects hitting the water produce sounds with source levels on the order of 240 to 271 dB re 1 µPa and pulse durations of 0.1 to 2 ms, depending on the size of the object (McLennan 1997). Impulses of this magnitude could potentially injure fish. Because the rise times of these shock waves are very short, the impulses causing injury and mortality derived for explosive sources were used to estimate effects of shock pulses created by missile and target effects.

While serious injury and/or mortality to individual fish would be expected if they were present in the immediate vicinity of a nonexplosive ordnance use, under the No Action Alternative, the total number of nonexplosive ordnance in the TMAA would be 15,770 items per year. Based on a TMAA size of 42,146 nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, the concentration of expended ordnance would be 1.9 per nm^2 (0.5 per km^2). More than 97 percent of these items would be from gunshells and small caliber rounds. Based on the low density of use, nonexplosive ordnance use would not result in significant impacts to fish populations. Disturbances to the water column would be short-term and localized, while disturbance to benthic habitats would be unlikely due to the water depth where training activities are proposed. Nonexplosive ordnance use under the No Action Alternative would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. Harm to fish populations or habitat from nonexplosive ordnance use in nonterritorial seas would be minimal in accordance with EO 11214.

The probability of fish ingesting expended ordnance would depend on factors such as the location of the spent materials, size of the materials, and the level of benthic foraging that occurs in the impact area, which is a function of benthic habitat quality, prey availability, and species-specific foraging strategies. It is possible that persistent expended ordnance could be colonized by benthic organisms, and mistaken for prey, or that expended ordnance could be accidentally ingested while foraging for natural prey items. As

discussed in Section 3.2, no long-term impacts to water or sediment quality are anticipated from ordnance-related materials.

Ingestion of expended ordnance may affect individual fish; however, ordnance-related expended materials under the No Action Alternative would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. Harm to fish populations or habitat from ordnance-related materials in nonterritorial seas would be minimal in accordance with EO 11214 under the No Action Alternative.

Target Related Materials

A variety of at-sea targets would be used in the TMAA, ranging from high-tech remotely operated airborne and surface targets (such as airborne drones) to low-tech floating at-sea targets (such as inflatable targets) and airborne towed banners. Many of the targets are designed to be recovered for reuse and are not destroyed during training. Under the No Action Alternative, LUU-2B/B illuminating flares, Tactical Air Launched Decoys (TALDs), BQM-74E unmanned aircraft, and MK-58 marine markers will not be recovered, resulting in approximately 1.53 tons (1,388 kg) of expended training materials.

Illuminating flares and marine markers are consumed during use. Smoke from marine markers rapidly diffuses by air movement. The MK-58 marine marker is approximately 2 ft (0.6 m) in length, and sinks to the bottom intact; these targets present no ingestion hazard to fish. It produces chemical flames and regions of surface smoke and are used in various training exercises to mark a surface position to simulate divers, ships, and points of contact on the surface of the ocean. The smoke dissipates in the air, having little effect on the marine environment. The marker itself is not designed to be recovered, and will eventually sink to the bottom and become encrusted or incorporated into the sediments. Phosphorus contained in the marker settles to the sea floor, where it reacts with the water to produce phosphoric acid until all phosphorus is consumed. Combustion of red phosphorus produces phosphorus oxides, which have a low toxicity to aquatic organisms. Red phosphorus released during training is not anticipated to substantially affect the marine environment (DoN 2006). Approximately 20 marine markers would be used in the TMAA under the No Action Alternative. Given the size of the TMAA and the low number of markers used, it would be very unlikely that fish would be affected by use of marine markers.

Under the No Action Alternative, eight TALDs would be used annually. TALDs operate as an expendable vehicle with no recovery capabilities, and use lithium sulfur dioxide batteries. An important component of the thermal battery is a hermetically-sealed casing of welded stainless steel 0.03- to 0.1-in thick that is resistant to the battery electrolytes. As discussed in Section 3.2, in the evaluation of the potential effects associated with seawater batteries, it is expected that in the marine environment, lithium potentially released from these batteries would be essentially nontoxic in seawater. Because of these factors, lithium batteries would not adversely affect fish.

The TALD will not result in any significant physical impacts to the sea floor, as it is unlikely that it would remain intact upon contact with the water. Therefore, small sections would be dispersed by currents prior to settling to the bottom. These pieces would sink into a soft bottom or would lie on a hard bottom, where they may provide a substrate for benthic colonization or eventually be covered by shifting sediments. Metal components are corroded by seawater at slow rates. Natural encrustation of exposed surfaces would eventually occur as invertebrates grow on the surfaces of the sunken objects. As the exterior becomes progressively more encrusted, the rates at which the metals will dissolve into the surrounding water will also decrease. Rates of deterioration would vary, depending on material and conditions in the immediate marine and benthic environment. Factors such as oxygen content, salinity, temperature, and pH all contribute to the manner and speed at which metals will dissolve. Over a period of years, the TALDs would degrade, corrode, and become encrusted or incorporated into the sediments, thus precluding adverse effects to fish.

The BQM-74E is a remote-controlled, subsonic, jet-powered aerial target that can be launched from the air or surface and recovered on land or at sea. It is powered by a jet engine, and thus contains oils, hydraulic fluid, batteries, and explosive cartridges. The hazardous materials of concern include propellant, petroleum products, metals, and batteries; however, the hazardous materials in aerial targets would be mostly consumed during training use.

As discussed in Section 3.2, expended seawater-activated batteries will not have a substantial impact to the environment because chemical reactions in batteries continue until battery life ends, with only a small amount of reactants remaining. Remaining chemicals will leach slowly, and will be diluted by ocean and tidal currents. Also discussed in Section 3.2, most target fragments will sink quickly in the sea. Expended material that sinks to the sea floor would gradually degrade, be overgrown by marine life, or be incorporated into bottom sediments.

Chaff

Chaff consists of aluminum-coated polymer fibers inside of a launching mechanism. Upon deployment, the chaff and small pieces of plastic are expended. Chaff may be deployed mechanically or pyrotechnically. Mechanical deployment results in expended paper materials, along with the chaff. Pyrotechnic deployment uses a small explosive cartridge to eject the chaff from a small tube. Chaff fibers are widely dispersed on deployment. Chaff settling on the ocean surface may temporarily raise turbidity, but will quickly disperse with particles eventually settling to the ocean floor.

An extensive review of literature, combined with controlled experiments, revealed that chaff use pose little risk to the environment or animals (U.S. Air Force 1997, Naval Research Laboratory 1999). The materials in chaff are generally nontoxic except in quantities significantly larger than those any marine fish could reasonably be exposed to from normal usage. Particulate tests and a screening health risk assessment concluded that the concern about chaff breaking down into respirable particle sizes is not a significant issue. Experiments have shown that animals should not suffer toxic or physical effects from chaff ingestion (U.S. Air Force 1997, Naval Research Laboratory 1999). There is no published evidence that chaff exposure has caused the death of a marine fish, and experiments have shown no direct effects of chaff on marine animals (U.S. Air Force 1997, Naval Research Laboratory 1999), therefore no effects of chaff on fish are expected.

Sonobuoys

Under the No Action Alternative, 24 SSQ-36 Bathythermograph (BT) sonobuoys will be expended. The SSQ-36 BT is designed to record the thermal gradient of the water at various depths. The primary source of contaminants in each sonobuoy is the seawater battery; these batteries have a maximum operational life of 8 hours, after which the chemical constituents in the battery are consumed. As described in Section 3.2, the immediate water and sediment quality may be affected by chemical leaching from expended sonobuoys, but ocean and tidal current will quickly disperse chemicals to nontoxic levels.

Given the size of the TMAA and the low number of sonobuoys used, it would be very unlikely that fish would be affected by use of sonobuoys. Sonobuoy emissions are not anticipated to accumulate or result in additive effects on water or sediment quality as would occur within an enclosed body of water since the constituents of sonobuoys would be widely dispersed in space and time throughout training areas. In addition, dispersion of released metals and other chemical constituents due to currents near the ocean floor would help minimize any long-term degradation of water and sediment quality. Therefore, sonobuoy-related materials under the No Action Alternative may have a short-term and localized effect, but would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from sonobuoy related materials in nonterritorial seas would be minimal under the No Action Alternative.

Summary of Impacts from Expended Materials

Nonexplosive training round, target, sonobuoy, chaff, and marine marker use under the No Action Alternative may affect fish, but the effects would be minimal because these elements of the action are not expected to have measurable or detectable impacts to fish. Expended materials under the No Action Alternative would not result in adverse affects to fish populations or EFH as defined under the MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from expended materials in nonterritorial seas would be minimal under the No Action Alternative.

Threatened and Endangered Species, and Critical Habitat

As discussed in Section 3.6.1.3, species of ESA-designated salmonids with known or potential occurrence in the TMAA include: Chinook, coho, chum, and sockeye salmon; and steelhead. No critical habitat (e.g., riparian, estuarine, nearshore marine, or offshore marine) occurs within the TMAA; however, impacts may occur to migratory juvenile or adult individuals, as discussed above for each activity. Based on analysis methods presented in Section 3.6.2.2, physical injury to salmonids could occur within the distances of an explosion shown in Tables 3.6-5 and 3.6-6. Fish injury and mortality from explosions are reduced by Navy protective measures, as discussed in Chapter 5. The Navy finds the activities associated with the No Action Alternative may affect the threatened salmonid species in the TMAA and the Navy is currently conducting ESA Section 7 consultations with NMFS to address effects to listed fish species for the Preferred Alternative (Alternative 2); however, no destruction or adverse modification of designated critical habitat would result from implementation of the No Action Alternative.

Essential Fish Habitat

This section discusses the potential impacts of the No Action Alternative to EFH and managed species. Species within all FMPs may utilize both nearshore and offshore areas during their lives, as eggs and larvae for most species are planktonic and can occur in nearshore and offshore waters, while adults may be present in nearshore and/or offshore waters. Therefore, all project activities under the No Action Alternative can potentially affect a lifestage of a managed species.

The proposed activities in the TMAA have the potential to result in the following impacts:

- Physical disruption of habitat;
- Physical destruction or adverse modification of benthic habitats;
- Alteration of water or sediment quality from expended material or discharge; and
- Cumulative impacts.

Effects to EFH could potentially result from vessel movements, aircraft overflights, explosive ordnance use, sonar activities, nonexplosive ordnance use, weapons firing disturbance, expended materials, and target related materials, all of which have been analyzed in the previous sections, and with a more focused analysis in a separate EFH Assessment. The analyses indicate that impacts to the water column habitat and fish would be short-term and localized, that adverse disturbance to benthic habitats would be unlikely due to the water depth where training activities occur and the avoidance of HAPCs (see Section 3.5, Marine Plants and Invertebrates). Therefore, the No Action Alternative would not result in adverse affects to EFH as defined under the MSFCMA.

3.6.2.4 Alternative 1

Under Alternative 1, the general level of some activities in the TMAA would increase relative to those under the No Action Alternative. In addition, training activities associated with force structure changes would be implemented for the EA-18G Growler, SSGN, P-8 MMA, DDG 1000, and UASs. Force

structure changes associated with new weapons systems would include new sonobuoys. Force structure changes associated with new training instrumentation include the PUTR.

Vessel Movements

As described for the No Action Alternative, the number of Navy vessels operating during training activities varies, but generally includes up to seven surface ships and one submarine (collectively referred to as vessels). Under Alternative 1, steaming hours would increase from current conditions, although the increase in steaming hours would not measurably increase potential effects to fish. Disturbance impacts to fish from vessel movements under Alternative 1 would be the same as those described for the No Action Alternative.

Vessel movements under Alternative 1 would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. In accordance with EO 11214 harm to fish populations or habitat from vessel movements in nonterritorial seas would be minimal under Alternative 1.

Aircraft Overflights

As described for the No Action Alternative, aircraft overflight responses would not compromise the general health or condition of individual fish or fish populations, and under Alternative 1, overflights would increase from current conditions. The increase in potential exposure to visual and sound disturbance would not measurably increase effects to fish. Thus, the impacts of overflights under Alternative 1 would be the same as those for the No Action Alternative.

Aircraft overflights under Alternative 1 would not result in adverse effects to fish populations or EFH as defined under MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from aircraft overflights in nonterritorial seas would be minimal under Alternative 1.

Explosive Ordnance

Explosive ordnance use would increase under Alternative 1 compared to the No Action Alternative (Table 3.6-8). In addition, Alternative 1 would include the use of the Improved Extended Echo Ranging (IEER) sonobuoys (IEER will be replaced by the Multi-Static Active Coherent [MAC] sonobuoy). Unlike other sonobuoys, IEER sonobuoys contain two Signal, Underwater Sound (SUS) explosive payloads (Class A) weighing 4.2 lb (1.9 kg) each. Explosive source sonobuoys could affect water quality by the release of explosive by-products, and could affect bottom habitats releasing chemicals (primarily from batteries) into the sediment. The sonobuoy explosive package consists primarily of HLX (i.e., explosive cord) and small amounts of plastic-bonded molding powder. Explosions create gaseous by-products, many of which travel to the surface and escape into the atmosphere. A small amount of the gas, however, dissolves into the water column. Although several by-products are produced, the products with greatest potential to result in toxicity are hydrogen fluoride compounds. However, only a minute amount of these substances are expected to be introduced, and they would be rapidly diluted by water movement. It is therefore considered unlikely that the explosive reactions associated with sonobuoys will result in localized impacts.

As described for the No Action Alternative, impacts to fish from explosions would be possible, but these elements of the action are not expected to have measurable or detectable impacts to fish given the vast area encompassing the TMAA (42,146 nm^2 [144,557 km^2]); impacts are further reduced using conservative estimates assuming that activities occur across 20 percent of the TMAA (Table 3.6-8). Habitat disturbance and fish injury and mortality from explosions are reduced by Navy mitigation measures, as discussed in Chapter 5. While serious injury and/or mortality to individual fish would be expected if they were present in the immediate vicinity of explosive ordnance use, explosions under Alternative 1 would not result in impacts to fish populations based on the low number of fish that would

be affected. Disturbance to water column and benthic habitats from explosions would be short-term and localized. The effects of other expended materials in sonobuoys (e.g., batteries) are discussed in Section 3.2. In accordance with EO 11214, harm to fish populations or habitat from explosive ordnance use in nonterritorial seas would be minimal under Alternative 1.

Impacts to fish under the No Action Alternative from explosions would be possible, but because these elements of the action are not expected to have measurable or detectable impacts to fish given the vast area encompassing the TMAA (42,146 nm^2 [144,557 km^2]); impacts are further reduced using conservative estimates assuming that activities occur across 20 percent of the TMAA (Table 3.6-8).

Sonar

Effects to fish populations and EFH from sonar use could potentially result from acoustic impacts if that sonar use was within their auditory or sensory detection capabilities (Table 3.6-10). Anti-Submarine Warfare (ASW) exercises include training sonar operators to detect, classify, and track underwater objects and targets. There are two basic types of sonar: passive and active. Passive sonars only listen to incoming sounds and, since they do not emit sound energy in the water, lack the potential to acoustically affect the environment. Active sonars emit acoustic energy to obtain information about a distant object from the reflected sound energy. Active sonars are the most effective detection systems against modern, ultra-quiet submarines and sea mines in shallow water.

Modern sonar technology has developed a multitude of sonar sensor and processing systems. In concept, the simplest active sonars emit acoustic pulses ("pings") and time the arrival of the reflected echoes from the target object to determine range. More sophisticated active sonars emit a ping and then scan the received beam to provide directional as well as range information. Only about half of the Navy's ships are equipped with active sonar and their use is generally limited to training and maintenance activities; 90 percent of sonar activity by the Navy is passive (DoN 2007).

Active sonars operate at different frequencies, depending on their purpose. High-frequency sonar (>10 kHz) is mainly used for establishing water depth, detecting mines, and guiding torpedoes. At higher frequencies, sound energy is greatly attenuated by scattering and absorption as it travels through the water. This results in shorter ranges, typically less than 5 nm (9.2 km). Mid-frequency sonar is the primary tool for identifying and tracking submarines. Mid-frequency sonar (1 kHz - 10 kHz) suffers moderate attenuation and has typical ranges of 1-10 nm (1.8-18.5 km). Low-frequency sonar (<1 kHz) has the least attenuation, achieving ranges over 100 nm (185 km). Low-frequency sonars are primarily used for long-range search and surveillance of submarines. SURTASS LFA is the U.S. Navy's low-frequency sonar system (DoN 2001b); it employs a vertical array of 18 projectors using the 100-500 Hz frequency range but is not proposed for use in the TMAA.

Sonars used in ASW are predominantly in the mid-frequency range (DoN 2007). ASW sonar systems may be deployed from surface ships, submarines, and rotary and fixed wing aircraft. The surface ships are typically equipped with hull-mounted sonar but may tow sonar arrays as well. Helicopters are equipped with dipping sonar (lowered into the water). Helicopters and fixed wing aircraft may also deploy both active and passive sonobuoys and towed sonar arrays to search for and track submarines.

Submarines also use sonars to detect and locate other subs and surface ships. A submarine's mission revolves around stealth, and therefore submarines use their active sonar very infrequently since the pinging of active sonar gives away their location. Submarines are also equipped with several types of auxiliary sonar systems for mine avoidance, for top and bottom soundings to determine the submarine's position in the water column, and for acoustic communications. ASW training targets simulating submarines may also emit sonic signals through acoustic projectors.

Table 3.6-10: Active Systems and Platforms Proposed for Use in the TMAA

System	Hours Modeled (Annual)		Associated Platform/Use
	Alt 1	Alt 2	
AN/SQS-53	289	578	DDG and CG hull-mounted sonar
AN/SQS-56	26	52	FFG hull-mounted sonar
AN/BQQ-10	24	48	Submarine hull-mounted sonar
AN/AQS-13 or AN/AQS-22	96	192	Helicopter dipping sonar
BQS-15	12	24	SSN navigation
PUTR Transponders	40	80	Portable Undersea Tracking Range
MK-84 Range Tracking Pingers	40	80	Ships, submarines, ASW targets
DICASS sonobuoy (AN/SSQ-62)	133	266	MPA deployed sonobuoys
IEER Sonobuoy (AN/SSQ-110A)	20	40	MPA deployed sonobuoys
MAC Sonobuoy (AN/SSQ-125)	20	40	MPA deployed sonobuoys
SUS, MK-84	12	24	Surface Ships and Aircraft
EMATT	6	12	Surface Ships and Aircraft

CG – Guided Missile Cruiser; DDG – Guided Missile Destroyer; FFG – Fast Frigate; DICASS – Directional Command-Activated Sonobuoy System; HF – High-Frequency; MF – Mid-Frequency.

Torpedoes use high-frequency, low-power, active sonar. Their guidance systems can be autonomous or electronically controlled from the launching platform through an attached wire. The autonomous guidance systems are acoustically based. They operate either passively, exploiting the emitted sound energy by the target, or actively, ensonifying the target and using the received echoes for tracking and targeting.

Military sonars for establishing depth and most commercial depth sounders and fish finders operate at high frequencies, typically between 24 and 200 kHz. Although low-frequency sonar is not proposed for use in the TMAA, the following text summarizes the types and potential impacts associated with the three main types of sonar.

Low-Frequency Sonar

Low-frequency sound travels efficiently in the deep ocean and is used by whales for long-distance communication (Richardson et al. 1995, NRC 2003, 2005). Concern about the potential for low-frequency sonar (<1 kHz) to interfere with cetacean behavior and communication has prompted extensive debate and research (DoN 2001b, 2007, NRC 2000, 2003).

Some studies have shown that low-frequency sound will alter the behavior of fish. For example, research on low-frequency devices used to deter fish away from turbine inlets of hydroelectric power plants showed stronger avoidance responses from sounds in the infrasound range (5-10 Hz) than from 50 and 150 Hz sounds (Knudsen et al. 1992, 1994). In test pools, wild salmon exhibit an apparent avoidance response by swimming to a deeper section of the pool when exposed to low-frequency sound (Knudsen et al. 1997).

Turnpenny et al. (1994) reviewed the risks to marine life, including fish, of high intensity, low-frequency sonar. Their review focused on the effects of pure tones (sine waves) at frequencies between 50 Hz and 1 kHz. Johnson (2001) evaluated the potential for environmental impacts of employing the SURTASS LFA sonar system. While concentrating on the potential effects on whales, the analysis did consider the potential effects on fish, including bony fish and sharks. It appears that the swimbladders of most fish are

too small to resonate at low frequencies and that only large pelagic species such as tunas have swimbladders big enough to resonate in the low-frequency range. However, investigations by Sand and Hawkins (1973) and Sand and Karlsen (1986) revealed resonance frequencies of cod swim bladders from 2 kHz down to 100 Hz.

Popper et al. (2005, 2007) investigated the impact of Navy SURTASS LFA sonar on hearing and on nonauditory tissues of several fish species. In this study, three species of fish in Plexiglass cages suspended in a freshwater lake were exposed to high-intensity LFA sonar pulses for periods of time considerably longer than likely LFA exposure. Kane et al. (2010) also conducted similar experiments using LFA, and similarly, results showed no mortality and no damage to body tissues either at the gross or histological level. Some individuals exhibited temporary hearing loss but recovered within several days of exposure. They noted that it could be possible that wild fishes (not caged) exposed to high intensity sounds might show behavioral responses that may affect feeding, reproduction, exposure avoidance or other important behaviors; however, the studies suggest that SURTASS LFA sonar does not kill or damage fish even in a worst case scenario.

Mid-Frequency Sonar

ASW training activities use sound sources mainly in the mid-frequency (1 kHz - 10 kHz) range and at or above the 3.5 kHz center frequency of the SQS-53 hull mounted sonar. The best available science indicates that with few exceptions, fish cannot hear sounds above about 3 kHz, and the majority of species are only able to detect sounds to 1 kHz or even below (Popper 2003, Hastings and Popper 2005). Thus, it is expected that most fish species would not be able to hear the ASW mid-frequency sonar proposed for use in the TMAA.

Some investigations have been conducted on the effect on fish of acoustic devices designed to deter marine mammals from gillnets (Gearin et al. 2000, Culik et al. 2001). While the devices used in these experiments had output that included a portion of the mid-frequency range, they are not otherwise similar to the sonar devices that would be used in ASW exercises. Gearin et al. (2000) concluded adult sockeye salmon were not disturbed by the sound from these devices. In field experiments to determine the reactions of herring (*Clupea harengus*) and harbor porpoise to acoustic alarm deterrent devices, Culik et al., (2001) found herring were not affected by the devices.

Jørgensen et al. (2005) examined the effects of 1 kHz to 6.5 kHz sounds on survival, development, and behavior of fish larvae and juvenile Atlantic herring (*Clupea harengus*), Atlantic cod (*Gadus morhua*), saithe (*Pollachius virens*), and spotted wolfish (*Anarhichas minor*). Swimbladder resonance experiments were also attempted on the herring, cod, and saithe. The investigators variously characterized the sound sources used in these exposure experiments as "low frequency sonar", "Low Frequency Active Sonars (MFAS)" and as having "simulating real sonar" and "sonar signals" but all in reference to sonar systems on Royal Norwegian Navy frigates and helicopters. The sounds tested were unlike any produced from U.S. Navy sonar[3] proposed for use in the TMAA but do provide data points for understanding affects from sound exposures longer in duration and closer to the center frequency of hearing for these species.

[3] For example U.S. Navy hull mounted mid-frequency anti-submarine systems do not include the 1.5 kHz range; the SQS-53 has a center frequency at 3.5 kHz; The continuous wave sounds were one second in duration repeated every five seconds (a least six times more frequent) for up to 100 exposures (too many to be representative; an approximate seven minute exposure); The frequency modulated signals tested were a sweep from 1 kHz to 3 kHz, which is much too broad a frequency sweep.

The 82 experimental exposures by Jørgensen et al. (2005) did not cause any significant direct mortality among the exposed fish except in two experiments[4] where significant mortality (approximately 20 to 30 percent) was observed for some larval and juvenile herring in the group. This was in contrast to the other 40 experiments on larval and juvenile herring having no significant mortality.

Some incidents of behavioral reactions were observed in the herring "during or after" sound at 1.5 kHz or to frequency sweeps (starting at 1 kHz and ending at 3 kHz) for exposures up to 100 seconds in duration. Sounds of this frequency and duration are not like mid-frequency sonar proposed for use in the TMAA. Histological studies found no physiological obvious affects from the sound exposure.

Kvadsheim and Sevaldsen (2005) undertook further analysis of Jørgensen et al. (2005) to determine if use of the same signals were extrapolated to the wild, would there be a significant impact on larvae and juvenile fish over a spawning ground. They conjectured that "normal sonar" operations would affect a smaller percentage than is subject to natural daily mortality. Based on the two incidents of mortality in 40 exposures seen in Jørgensen et al. (2005), Kvadsheim and Sevaldsen (2005) did suggest use of continuous-wave transmissions within the frequency band corresponding to swim bladder resonance of small herring could increase the predicted mortality by an order of magnitude. To reiterate, the sound frequency and duration upon which this prediction was made is not representative of the type of U.S. Navy sonar proposed for use by this EIS/OEIS.

Doksæter et al. (2009) more recently investigated exposure of herring to mid-frequency sonar and concluded that, "the operation of sonar systems at the tested frequencies and source levels above 1 kHz and 209 dB rms re 1 Pa at 1 m will not have any large scale detrimental effects on overwintering herring populations or on the commercial herring fishery." The investigators concluded that, "Military sonars of such frequencies and source levels may thus be operated in areas of overwintering herring without substantially affecting herring behavior or herring fishery" (Doksæter et al. 2009).

Experiments on fish classified as hearing specialists (but not those classified as hearing generalists) have shown that exposure to loud sound can result in temporary hearing loss, but it is not evident that this may lead to long-term behavioral disruptions in fish that are biologically significant (Amoser and Ladich 2003, Smith et al. 2004 a,b). There is no information available that suggests that exposure to nonimpulsive acoustic sources results in fish mortality.

In summary, proposed ASW training activities use mid-frequency sound sources at or above the 3.5 kHz center frequency of the SQS-53 hull mounted sonar and with few exceptions, fish cannot hear sounds above about 3 kHz (Popper 2003, Hastings and Popper 2005). Thus, it is expected that most fish species would not be able to hear the mid-frequency sonar proposed for use in the TMAA. If responses to mid-frequency sonar use do occur, behavioral responses would be brief, reversible, and not biologically significant. Sustained auditory damage is not expected (Kane et al. 2010). Sensitive life stages (juvenile fish, larvae and eggs) very close to the sonar source may experience injury or mortality, but below the level of loss of larval and juvenile fish from natural causes. The use of Navy mid-frequency sonar would not compromise the productivity of fish or adversely affect their habitat.

High-Frequency Sonar

Although most fish cannot hear high frequencies sound, some shad and herring species can detect sounds over 20 kHz. (Mann et al. 2001, Higgs et al. 2004). Ross et al. (1996) reviewed the use of high-frequency

[4] Experiment 21 - One second exposures every five seconds at 1.5 kHz and 189 dB (20 times) for 100 seconds and Experiment 40 - one second exposures every five seconds at 3.4 kHz and 179 dB (20 times) for 100 seconds.

sound to deter alewives from entering power station inlets and suggested that impingement of alewives was reduced by 81–84%. The alewife, a member of the shad family (Alosinae) which can hear sounds at high frequencies (Mann et al. 2001), uses high-frequency hearing to detect and avoid predation by cetaceans. Wilson and Dill (2002) demonstrated that exposure to broadband sounds with high frequencies cause behavioral modification in Pacific herring.

Since high-frequency sound attenuates quickly in water, high levels of sound from sonars in this range would be restricted to within a few meters of the source. Even for fish able to hear sound at high frequencies, only short-term exposure would occur, thus high-frequency military sonars are not expected to have significant effects on resident fish populations.

Because a torpedo emits sonar pulses intermittently and is traveling through the water at a high speed, individual fish would be exposed to sonar from a torpedo for a brief period. At most, an individual animal would hear one or two pings from a torpedo and would be unlikely to hear pings from multiple torpedoes over an exercise period. Most fish hear best in the low- to mid-frequency range and, therefore, are unlikely to be disturbed by torpedo pings.

The effects of high-frequency sonar on fish behavior for species that can hear high-frequency sonar would be transitory and of little biological consequence. Most species of fish would not hear these sounds and would therefore experience no disturbance.

Conclusion – Sonar Use

While the impact of anthropogenic sound on marine mammals has been extensively studied, the effects of sound on fish are largely unknown (Popper 2003, Hastings and Popper 2005, Popper 2008, Popper and Hastings 2009). There is a dearth of empirical information on the effects of exposure to sound, let alone sonar, for the vast majority of fish. The few studies on sonar effects have focused on behavior of individuals of a few species and it is unlikely their responses are representative of the wide diversity of other marine fish species (Popper and Hastings 2009). The literature on vulnerability to injury from exposure to loud sounds is similarly limited, relevant to particular species, and, because of the great diversity of fish, not easily extrapolated. More well-controlled studies are needed on the hearing thresholds for fish species and on temporary and permanent hearing loss associated with exposure to sounds. The effects of sound may not only be species specific, but also depend on the mass of the fish (especially where any injuries are being considered) and life history phase (eggs and larvae may be more or less vulnerable to exposure than adult fish). The use of sounds during spawning by some fish, and their potential vulnerability to masking by anthropogenic sound sources, also requires further investigation. No studies have established effects of cumulative exposure of fish to any type of sound or have determined whether subtle and long-term effects on behavior or physiology could have an impact upon survival of fish populations. The use of sounds during spawning by some fish and their potential vulnerability to masking by anthropogenic sound sources requires closer investigation.

With these caveats and qualifications in mind, the limited information currently available suggests that populations of fish are unlikely to be affected by the projected rates and areas of use of military sonar. Most fish species are not capable of hearing mid-frequency and high frequency sonar. Short-term behavioral responses such as startle and avoidance may occur, but are not likely to adversely affect indigenous fish communities. Auditory damage from sonar signals is not expected and there is no indication that nonimpulsive acoustic sources would result in mortality to fish populations. Thus, sonar use in TMAA training is not anticipated to result in adverse affects to fish populations or EFH as defined under the MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from sonar use in nonterritorial seas would be minimal under Alternative 1.

Weapons Firing Disturbance

Under Alternative 1, weapons firing activities would increase by 40 percent (Table 3.6-8), but because fish apparently only react to impulsive sounds greater than 160 dB, only those in the immediate vicinity (0.004 nm^2 [0.015 km^2] area) would be affected and effects would be limited to short-term, transitory alarm or startle responses. Since activities are infrequent and widely dispersed throughout the TMAA, the impacts to fish would be the same as those described for the No Action Alternative.

Under Alternative 1, weapons firing may affect fish, but this effect would be minimal. Weapons firing under Alternative 1 would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. Furthermore, harm to fish from weapons firing would not be likely in nonterritorial seas in accordance with EO 12114.

Expended Materials

Under Alternative 1, the total number of expended ordnance in the TMAA would be 20,223 items per year, an increase of 26 percent. Based on an open ocean area of 42,146 nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, 2.4 items per nm^2 (0.07 per km^2) per year would be deposited in the ocean (see Table 3.6-9). More than 93 percent of these items would be from gunshells and small caliber rounds.

The increase in potential exposure would not measurably increase effects to fish. Given the large area of the TMAA and low concentration of expended materials, with no potential for long-term degradation of water and sediment quality (See Section 3.2, Expended Materials, and 3.3, Water Resources), the impacts to fish would be the same as those described for the No Action Alternative. Similarly, ingestion of expended materials is possible, but has a low potential for occurrence, as described for the No Action Alternative. Habitat disturbance and fish injury and mortality from expended materials use are reduced by Navy mitigation measures, as discussed in Chapter 5. While serious injury and/or mortality to individual fish would be expected if they were present in the immediate vicinity of expended materials contacting the ocean surface, implementation of Alternative 1 would not result in impacts to fish populations based on the low number of fish that would be affected. Disturbances to water column and benthic habitats from expended materials would be short-term and localized.

Expended materials under Alternative 1 would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from expended materials in nonterritorial seas would be minimal under Alternative 1.

Portable Undersea Tracking Range

The PUTR is a self-contained, portable, undersea tracking capability that employs modern technologies to support coordinated undersea warfare training for Forward Deployed Naval Forces (FDNF). PUTR will be available in two variants to support both shallow and deep water remote activities in keeping with Navy requirements to exercise and evaluate weapons systems and crews in the environments that replicate the potential combat area. The system will be capable of tracking submarines, surface ships, weapons, targets, and Unmanned Underwater Vehicles (UUVs) and distribute the data to a data processing and display system, either aboard ship, or at a shore site.

No area supporting a PUTR system has been identified; however, potential impacts to EFH can be assessed based on several assumptions. Assuming that transponders are deployed on soft-bottom habitats, impacts would be similar to those discussed for expended materials. There would be direct impact to soft bottom habitat where the clump weight contacted the bottom, which may result in localized mortality to epifauna and infauna within the footprint, although it is anticipated that recolonization would occur within a relatively short period of time. Upon completion of the exercise, the transponders are recovered, which

eliminates any potential impacts associated with hazardous materials such as batteries and electronic components. The clump weight is not recovered, and since it is composed of inert material, it is not a potential source of contaminants, and could provide a substrate for benthic fauna. There may also be indirect effects associated with increased turbidity due to resuspension of sediments from the clump weight contacting the bottom. The turbidity plume is expected to be localized and temporary, as sediment would eventually settle to the ocean floor or be dispersed by ocean currents. Therefore, localized and temporary impacts to benthic fauna and water quality may occur from the PUTR, but no long-term impacts are anticipated. Impacts from the PUTR under the Alternative 1 would not result in adverse effects to fish populations or EFH as defined under MSFCMA. In accordance with EO 11214, harm to fish populations or habitat from explosive ordnance use in nonterritorial seas would be minimal under the No Action Alternative.

Threatened and Endangered Species and Critical Habitat

As discussed in Section 3.6.1.3, species of ESA-designated salmonids with known or potential occurrence in the TMAA include Chinook, coho, chum, and sockeye salmon; and steelhead. No critical habitat (e.g., riparian, estuarine, nearshore marine, or offshore marine) occurs within the TMAA. However, impacts may occur to migratory juvenile or adult individuals, as discussed for No Action Alternative. Based on analysis methods presented in Section 3.6.2, physical injury to salmonids could occur within the distances of an explosion shown in Tables 3.6-6 and 3.6-7. Fish injury and mortality from explosions are reduced by Navy protective measures, as discussed in Chapter 5.

Pursuant to the ESA, Section 7, the Navy finds the activities associated with Alternative 1 may affect the threatened salmonid species in the TMAA; the Navy is currently conducting Section 7 consultations with NMFS to address effects to listed fish species for the Preferred Alternative (Alternative 2). No destruction or adverse modification of designated critical habitat would result from implementation of Alternative 1.

Essential Fish Habitat

Under Alternative 1, the level of activities in the TMAA would increase relative to the baseline No Action Alternative. However, these increases would not measurably increase potential effects to EFH. The EFH assessment concludes that vessel movements, aircraft overflights, explosive ordnance use, sonar activities, weapons firing disturbance, expended materials, and target related materials under Alternative 1 would not result in adverse affects to EFH as defined under the MSFCMA.

3.6.2.5 Alternative 2

Implementation of Alternative 2 would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional separate summertime CSG exercise lasting up to 21 days within the ATA.
- Conduct a SINKEX in each summertime exercise (a maximum of two) in the TMAA.

Vessel Movements

As described for the other alternatives, the number of Navy vessels operating during training exercises varies and would average eight vessels per activity. Under Alternative 2, steaming hours would increase from current conditions, although the increase in steaming hours would not measurably increase potential effects to fish. Disturbance impacts to fish from vessel movements under Alternative 2 would be the same as those described for the No Action Alternative.

Vessel movements under Alternative 2 would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. Furthermore, harm to fish populations or habitat from vessel movements in nonterritorial seas would be minimal in accordance with EO 11214.

Aircraft Overflights

As described for the No Action Alternative, aircraft overflight responses would not compromise the general health or condition of individual fish or fish populations, and under Alternative 2, overflights would increase from current conditions. The increase in potential exposure to visual and sound disturbance would not measurably increase effects to fish. Thus, the impacts of overflights under Alternative 2 would be the same as those for the No Action Alternative.

Aircraft overflights under Alternative 2 would not result in adverse effects to fish populations or EFH as defined under MSFCMA. Furthermore, harm to fish populations or habitat from aircraft overflights in nonterritorial seas would be minimal in accordance with EO 11214.

Explosive Ordnance

Explosive ordnance use would increase under Alternative 2 compared to the No Action Alternative (Table 3.6-8). And similar to Alternative 1, Alternative 2 would include the use of the IEER sonobuoy. As described for the No Action Alternative, impacts to fish from explosions would be possible, but these elements of the action are not expected to have measurable or detectable impacts to fish given the vast area encompassing the TMAA (42,146 nm^2 [144,557 km^2]); impacts are further reduced using conservative estimates assuming that activities occur across 20 percent of the TMAA (Table 3.6-8). Habitat disturbance and fish injury and mortality from explosions are reduced by Navy mitigation measures, as discussed in Chapter 5. While serious injury and/or mortality to individual fish would be expected if they were present in the immediate vicinity of explosive ordnance use, explosions under Alternative 2 would not result in impacts to fish populations based on the low number of fish that would be affected. Disturbances to water column and benthic habitats from explosions would be short-term and localized. The effects of other expended materials in sonobuoys are discussed in Section 3.2.

Sonar

Under Alternative 2, sonar would have the potential to affect fish in the TMAA. Most fish species would not be able to detect mid-frequency and high frequency sonar. Short-term behavioral responses such as startle and avoidance may occur, but are not likely to adversely affect indigenous fish communities. Auditory damage from sonar signals is not expected and there is no indication that nonimpulsive acoustic sources result in fish mortality. Sonar use under Alternative 2 would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. Furthermore, harm to fish populations or habitat from sonar use in nonterritorial seas would be minimal in accordance with EO 11214.

Weapons Firing Disturbance

Under Alternative 2, weapons firing activities would increase by 180 percent (Table 3.6-8), but because fish apparently only react to impulsive sounds greater than 160 dB, only those in the immediate vicinity (0.015 km^2 area) would be affected and effects would be limited to short-term, transitory alarm or startle responses. Since activities are infrequent and widely dispersed throughout the TMAA, the impacts to fish would be the same as those described for the No Action Alternative.

Under the Alternative 2, weapons firing may affect fish, but this affect would be minimal. Weapons firing under Alternative 2 would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. Furthermore, harm to fish from weapons firing would not be likely in nonterritorial seas in accordance with EO 12114.

Expended Materials

Under Alternative 2, expended materials in the TMAA would increase approximately 160 percent over the No Action Alternative (see Table 3.6-9). Based on an open ocean area of 42,146 nm^2 (144,557 km^2) and conservatively assuming that activities occur across 20 percent of the TMAA, 4.9 items per nm^2 (1.4 per km^2) per year would be deposited in the ocean. More than 91 percent of these items would be from gunshells and small caliber rounds. Despite the increase in expended materials, given the large area of the TMAA and low concentration of expended materials, with no potential for long-term degradation of water and sediment quality (See Section 3.2, Expended Materials, and 3.3, Water Resources), the impacts to fish would be the same as those described for the No Action Alternative.

Under Alternative 2, ingestion of expended materials is possible, but has a low potential for occurrence, as described for the No Action Alternative. Expended materials under Alternative 2 would not result in adverse effects to fish populations or EFH as defined under the MSFCMA. Furthermore, harm to fish populations or habitat from expended materials in nonterritorial seas would be minimal in accordance with EO 11214.

Portable Undersea Tracking Range

Under Alternative 2, impacts from the PUTR would be similar to those described for Alternative 1, with localized and temporary impacts to benthic fauna, water quality, and EFH, but no long-term adverse impacts are anticipated.

SINKEX

Under Alternative 2, a SINKEX is typically conducted by aircraft, surface ships, and submarines in order to take advantage of a full size ship target and an opportunity to fire live weapons. The target is typically a decommissioned combatant or merchant ship that has been made environmentally safe for sinking according to standards set by the U.S. Environmental Protection Agency (USEPA). It is placed in a specific location that is greater than 50 nm (93 km) out to sea and in water depths greater than 6,000 ft (1,830 m) (40 C.F.R. § 229.2) so that when it sinks it will serve another purpose, such as a reef, or be in deep water where it will not be a navigation hazard to other shipping. Ship, aircraft, and submarine crews typically are scheduled to attack the target with coordinated tactics and deliver live ordnance to sink the target.

Aspects of the exercise that have potential effects on fish are vessel movement, aircraft overflights, active sonar, surface firing noise, shock waves from munitions hitting the water, munitions constituents, missile launches, shock waves, underwater detonations, and presence of expended materials (fragments of missiles and bombs). These stressors have been analyzed separately in previous sections, and while serious injury and/or mortality to individual fish would be expected if they were present in the immediate vicinity of several of these stressors (e.g., explosive ordnance), SINKEX under Alternative 2 would not result in impacts to fish populations based on the low number of fish that would be affected and the avoidance of HAPCs. Disturbances to water column and benthic habitats from SINKEX would be short-term and localized (See Section 3.5).

Threatened and Endangered Species and Critical Habitat

As discussed in Section 3.6.1.3, species of ESA-designated salmonids with known or potential occurrence in the TMAA include Chinook, coho, chum, and sockeye salmon; and steelhead. No critical habitat (e.g., riparian, estuarine, nearshore marine, or offshore marine) occurs within the TMAA. However, impacts may occur to migratory juvenile or adult individuals, as discussed for No Action Alternative. Based on analysis methods presented in Section 3.6.2, physical injury to salmonids could occur within the distances

of an explosion shown in Tables 3.6-6 and 3.6-7. Fish injury and mortality from explosions are reduced by Navy protective measures, as discussed in Chapter 5.

Pursuant to the ESA, Section 7, the Navy finds the activities associated with Alternative 2 may affect the threatened salmonid species in the TMAA; the Navy is currently conducting Section 7 consultations with NMFS to address effects to listed fish species for the Preferred Alternative (Alternative 2). No destruction or adverse modification of designated critical habitat would result from implementation of Alternative 2.

Essential Fish Habitat

Under Alternative 2, the level of activities in the TMAA would increase relative to the baseline No Action Alternative. However, these increases would not measurably increase potential effects to EFH. The EFH assessment concludes that vessel movements, aircraft overflights, explosive ordnance use, sonar activities, weapons firing disturbance, expended materials, and target-related materials under Alternative 2 would not result in adverse affects to EFH as defined under the MSFCMA.

3.6.3 Mitigation

As summarized in Section 3.6.4, the alternatives proposed in the EIS/OEIS would be expected to affect individual fish and have localized effects on their habitats, but would not affect communities or populations of species or their use of the TMAA. Mitigation measures for at-sea activities involving explosive ordnance, implemented for marine mammals and sea turtles, also offer protections to habitats associated with fish communities. These current protective measures detailed in Chapter 5 (such as utilization of general maritime measures and buffer zones for marine mammals as well as marine vegetative communities) would continue to be implemented, and no further mitigation measures would be needed to protected fish in the TMAA.

3.6.4 Summary of Effects by Alternative

Table 3.6-11 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on fish and EFH under both NEPA and EO 12114.

Table 3.6-11: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Overflights would not adversely affect fish populations or EFH as defined under the MSFCMA. See page 3.6-30.	• Vessel movement, aircraft overflight, weapons firing disturbance, and expended materials would result in minimal harm to fish or EFH. Given the TMAA size and using conservative estimates, the concentration of expended materials would be 1.9 per nm^2 (0.5 per km^2). More than 97 percent of these items would be from gunshells and small caliber rounds. • Explosive ordnance use may result in injury or mortality to individual fish but would not result in impacts to fish populations. Given the TMAA size and using conservative estimates, the concentration of explosive ordnance would be 0.010 per nm^2 (0.003 per km^2). • Activities would not adversely affect fish populations or EFH as defined under the MSFCMA. • May affect ESA-listed fish species. • No effect to designated critical habitat.

Table 3.6-11: Summary of Effects by Alternative (continued)

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 1	• Overflights would not adversely affect fish populations or EFH as defined under the MSFCMA. See page 3.6-38.	• Vessel movement, aircraft overflight, weapons firing disturbance, and expended materials would result in minimal harm to fish or EFH. Given the TMAA size and using conservative estimates, the concentration of expended materials would be 2.4 per nm^2 (0.7 per km^2). More than 93 percent of these items would be from gunshells and small caliber rounds. • Explosive ordnance use may result in injury or mortality to individual fish but would not result in impacts to fish populations. Given the TMAA size and using conservative estimates, the concentration of explosive ordnance would be 0.020 per nm^2 (0.006 per km^2). • Because only a few species of fish may be able to hear the relatively higher frequencies of mid-frequency sonar, sonar used in Navy exercises would result in minimal harm to fish or fish habitat. • Activities would not adversely affect fish populations or EFH as defined under the MSFCMA.. • May affect ESA-listed species. • No effect to designated critical habitat.

Table 3.6-11: Summary of Effects by Alternative (continued)

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 2 (Preferred Alternative)	• Overflights would not adversely affect fish populations or EFH as defined under the MSFCMA. See page 3.6-45.	• Vessel movement, aircraft overflight, weapons firing disturbance, and expended materials would result in minimal harm to fish or EFH. Given the TMAA size and using conservative estimates, the concentration of expended materials would be 4.9 per nm^2 (1.4 per km^2). More than 91 percent of these items would be from gunshells and small caliber rounds. • Explosive ordnance use may result in injury or mortality to individual fish but would not result in impacts to fish populations. Given the TMAA size and using conservative estimates, the concentration of explosive ordnance would be 0.142 per n^{m2} (0.041 per k^{m2}). • Because only a few species of fish may be able to hear the relatively higher frequencies of mid-frequency sonar, sonar used in Navy exercises would result in minimal harm to fish or fish habitat. • Activities would not adversely affect fish populations or EFH as defined under the MSFCMA. No SINKEXs would be conducted in HAPCs. • May affect ESA-listed species. • No effect to designated critical habitat.

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3.7 Sea Turtles

3.7 SEA TURTLES

3.7.1 Affected Environment

For the purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the region of influence (ROI) for sea turtles is the Temporary Maritime Activities Area (TMAA). With the exception of Cape Cleare on Montague Island located over 12 nautical miles (nm) (22 kilometers [km]) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore. Given that the TMAA is more than 12 nm (22 km) from the closest point of land, it is therefore outside of United States (U.S.) territorial seas.

3.7.1.1 Existing Conditions

Sea turtles are long-lived reptiles that can be found throughout the world's tropical, subtropical, and temperate seas (Caribbean Conservation Corporation and Sea Turtle Survival League 2003). Sea turtles are highly adapted for life in the marine environment. Sea turtles possess powerful, modified forelimbs (or flippers) that enable them to swim continuously for extended periods of time (Wyneken 1997). Sea turtles are among the longest and deepest diving of the air-breathing marine vertebrates, spending as little as 3 to 6 percent of their time at the water's surface (Lutcavage and Lutz 1997). Sea turtles often travel thousands of miles between their nesting beaches and feeding grounds (Ernst et al. 1994, Meylan 1995). Sea turtles cannot withdraw their head or limbs into their shell, so growing to a large size as adults is important to avoid predation.

The distribution of sea turtles in ocean waters off the U.S. West Coast and the GOA is strongly affected by seasonal changes in water temperature. Cool water temperatures also prevent sea turtles from nesting on U.S. west coast beaches and may also inhibit reproductive activity by reducing the quality and availability of food resources in the area (Fuentes et al. 2000). In general, sea turtle sightings off the U.S. west coast south of the GOA peak during July through September and in abnormally warm water years such as in El Niño years. During El Niño years, changes in ocean currents bring warmer waters north, which can bring more sea turtles (and their preferred prey) to the west coast region (Washington to California) and as far north as Alaska (National Marine Fisheries Service [NMFS] 2003). There are no known sea turtle nesting areas in the Alaska region.

All sea turtles are listed as endangered or threatened under the Endangered Species Act (ESA). There are seven living species of sea turtles from two taxonomic families, the Cheloniidae (hard-shelled sea turtles; six species) and the Dermochelyidae (leatherback turtles; one species). Five species of sea turtles occur in the North Pacific: leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), olive ridley (*Lepidochelys olivacea*), and hawksbill (*Eretmochelys imbricata*). However, only four species have been observed, albeit rarely, in Alaska waters between 1960 and 1998: the leatherback, loggerhead, green, and olive ridley (Hodge and Wing 2000).

Although members of the Cheloniidae family of sea turtles occur in the warm, subtropical areas of the Pacific such as southern California and Hawaii, the GOA is considered beyond their normal range of occurrence because of cold water temperatures. The ocean waters of the TMAA have an average sea surface temperature in summer in the upper 100 m (328 feet [ft]) of approximately 51.8 degrees Fahrenheit (°F) (11 degrees Celsius [°C]). Most hard-shell turtles seek optimal seawater temperatures near 65°F and are cold-stressed at seawater temperatures below 50°F (Mrosovsky 1980, Schwartz 1978). In contrast, leatherback sea turtles regularly occur in cold temperate waters of high latitudes (Bleakney 1965, Pritchard 1980, and Eckert et al. 1989). Individuals will often move into cooler temperate waters and sometimes cold northern waters during late summer and early fall (Keinath and Musick 1990, James et al. 2005).

After analyzing 363 records of sea turtles sighted along the Pacific coast of North America, Stinson (1984) concluded that the leatherback was the most common sea turtle in U.S. waters north of Mexico. In Alaska, 19 leatherback sea turtle occurrences were documented between 1960 and 2006, including two summer occurrences recorded near Cordova, Alaska, which is north of the TMAA (Hodge and Wing 2000, DoN 2006). Also recorded during that time frame were 9 green sea turtle occurrences, 2 olive ridley occurrences, and 2 loggerheads. Therefore, although sightings of sea turtles from the Chelonidae family have been documented in Alaska, most of these involve individuals that were either cold-stressed, likely to become cold-stressed, or already deceased (Hodge and Wing 2000, McAlpine et al. 2002). Thus, the TMAA is considered to be outside the normal range for sea turtle species of the Cheloniidae family and this family of sea turtles is not considered for further analysis in this EIS/OEIS.

The leatherback turtle, however, is distributed globally in tropical, subtropical, and temperate waters throughout the year and is the only species of sea turtle expected to occur in the TMAA and thus is considered further in this analysis.

The issues of concern for leatherback sea turtles include potential effects of sounds in the water, and impacts related to vessel movements, ordnance use, and possible entanglement or contact with expended materials that are not recovered. The analysis of effects addresses these issues by grouping effects based on activities with common components such as vessel movement, ordnance use, and expended materials.

Species Accounts and Life History

The leatherback sea turtle is listed under the ESA as endangered throughout its range. There is a recovery plan for this species. Critical habitat is designated for this species in waters near the U.S. Virgin Islands (44 FR 17710, March 23, 1979). Critical habitat has not been identified for this species along the U.S. Pacific coast, including the TMAA, largely because nesting is not known to occur and important foraging areas have not been identified (NMFS and USFWS 1998a).

The leatherback sea turtle is the most oceanic and has the widest range (71°N to 47°S) of the seven living species of sea turtles (Boulon et al. 1988, Pritchard and Trebbau 1984). Leatherback sea turtles have been documented in Alaska waters as far north as approximately 60º latitude (approximately 50 miles north of the northern edge of the TMAA) and as far west in the GOA as the Aleutian Islands (Eckert 1993) Although leatherback turtles are expected to be present within the TMAA, they are likely few in number given the TMAA is near the northern edge of the known extent of their Pacific range (Eckert 1993, DoN 2006). No numbers or density estimates are available for leatherback turtles in the TMAA, but given their distribution patterns based on water temperature elsewhere (Eckert 1993) the number of leatherback sea turtles in the GOA are likely very low. The analysis in this EIS/OEIS therefore assumes leatherback turtles may be encountered in the TMAA during the summer (April to October) although they will be extremely rare (very few in number).

The leatherback, which is the largest living sea turtle, has a unique carapace structure. The carapace lacks the outer layer of external plates or scales possessed by all other sea turtles. Instead, it is composed of a flexible layer of dermal bones underlying tough, oily connective tissue and smooth skin. The body of a leatherback is barrel-shaped, tapered to the rear, with seven longitudinal dorsal ridges; the body is almost completely black with variable spotting (McDonald and Dutton 1996). Carapace lengths in adult leatherbacks range from about 50 to 70 inches (in) (1.2 to 1.8 meters [m]), with an average around 57 in (1.4 m) and weighing between 450 and 1,575 pounds (lb) (200 to 700 kilograms [kg]) (NMFS and U.S. Fish and Wildlife Service [USFWS] 1998), although there is documentation suggesting this average may be greatly exceeded (Eckert and Luginbuhl 1988).

In contrast with other sea turtles, leatherback sea turtles have physiological traits that allow for the conservation of body heat which enable them to maintain body core temperatures well above the ambient

water temperatures (Mrosovsky and Pritchard 1971, Greer et al. 1973, Neill and Stevens 1974, Goff and Stenson 1988, Paladino et al. 1990, Eckert 1993, Lutz and Musick 1996, DoN 2006). Shells, or carapaces, of adult leatherbacks are 4 cm (1.5 inches) thick on average, contributing to the leatherback's thermal tolerance that enables this species to forage in water temperatures far lower than the leatherback's core body temperature (Center for Biological Diversity et al. 2007). In an analysis of available sightings (Eckert 2002), researchers found that leatherback turtles with carapace lengths smaller than 100 cm (39 inches) were sighted only in waters 79°F or warmer, while adults were found in waters as cold as 32°F to 59°F off Newfoundland (Goff and Lien 1988). As a result, they are more capable of surviving for extended periods of time in cooler waters than the hard-shelled sea turtles (Bleakney 1965, Lazell 1980).

Historically, some of the world's largest nesting populations of leatherback turtles were found in the Pacific Ocean, although nesting on Pacific beaches under U.S. jurisdiction has always been rare (NMFS and USFWS 1998c). The northernmost nesting sites in the eastern Pacific Ocean are located in the Mexican states of Baja California Sur and Jalisco (Fritts et al. 1982). Post-nesting adults appear to migrate along bathymetric contours from 656 to 11,483 ft (200 to 3,500 m) (Morreale and Standora 1994), and most of the eastern Pacific nesting stocks migrate south (NMFS 2002). Other principal nesting sites in the Pacific Ocean indicate that gene flow between eastern and western Pacific nesting populations is restricted (Dutton et al. 1998, 1999, 2000a, 2000b).

Leatherbacks are highly pelagic and specialized for life at sea. Occasionally, sea turtles can end up on the shore if they are dead, sick, injured, or cold-stressed. These events, known as strandings, can be caused by either biological factors (e.g., predation and disease) or environmental factors (e.g., water temperature). In addition, leatherbacks approach coastal waters only during the reproductive season (EuroTurtle 2001). Male leatherbacks do not return to land after they hatch from their nests whereas mature females return to land only to lay eggs (Carr 1995, Spotila et al. 1997). Aside from this brief terrestrial period, which lasts approximately three months during egg incubation and hatching, leatherback turtles are rarely encountered out of the water. Sea turtles bask on the water surface to regulate their body temperatures, elude predators, avoid harmful mating encounters, possibly accelerate the development of their eggs, and destroy aquatic algae growth on their carapaces (Whittow and Balazs 1982, Spotila et al. 1997). Hatchling leatherbacks are pelagic, but nothing is known about their distribution during the first 4 years of life (Musick and Limpus 1997).

The leatherback is one of the deepest divers in the ocean, with dives as deep as 3,937 ft (1,200 m), although it spends most of its time feeding at a depth of less than 328 ft (100 m) (DoN 2006). Leatherback turtles primarily feed on gelatinous zooplankton such as cnidarians (jellyfish and siphonophores) and tunicates (salps and pyrosomas) (Bjorndal 1997, NMFS and USFWS 1998). The leatherback dives continually and spends short periods of time on the surface between dives (Eckert et al. 1986, Southwood et al. 1999). Typical dive durations averaged 6.9 to 14.5 minutes (min) per dive, with a maximum of 42 min (Eckert et al. 1996). Sea turtles typically remain submerged for several minutes to several hours depending upon their activity state (Standora et al. 1984, Renaud and Carpenter 1994). Long periods of submergence hamper detection and confound census efforts. Leatherbacks dive continually and spend short periods on the surface between dives (Eckert et al. 1986, Southwood et al. 1999). During migrations or long distance movements, leatherbacks maximize swimming efficiency by traveling within 15 ft (5 m) of the surface (Eckert 2002).

The world female leatherback turtle population is estimated at 35,860 (Spotila 2004). The western Pacific (west of the International Date Line) leatherback population was estimated to contain 2,700 to 4,500 nesting females (Dutton et al. 2007). A subset of these females, and an unknown number of males, forage off the U.S. west coast (Washington to California) each year from about May to November, when dense aggregations of jellyfish (leatherback prey) are present (Benson et al. 2007a, 2007b). Foraging abundance

estimates are only available for nearshore waters off California, where the estimated minimum leatherback abundance has ranged from 12 to 379 individuals per year, based on aerial surveys.

Natural and Induced Mortality

The decline of sea turtles is believed primarily to be the result of exploitation by humans for the eggs and meat, commercial and recreational fishing with nets, longlines, trawls, seines, and hook-and-lines, loss or degradation of nesting habitat from coastal development, pollution and contaminants, marine debris, and watercraft strikes. Leatherbacks are seriously declining at all major Pacific basin nesting beaches, including those in Indonesia, Malaysia, and southwestern Mexico (NMFS and USFWS 1998).

A major factor in the decline of the leatherback turtle worldwide is commercial harvesting for meat and eggs. The crash of the Pacific leatherback turtle population, once the world's largest, is believed to be primarily the result of exploitation by humans for their eggs and meat. Enforcement of existing laws in remote areas is also a major problem.

It was estimated that worldwide, more than 50,000 leatherbacks were incidentally taken as pelagic longline bycatch in 2000 and that thousands die from longline gear interactions every year in the Pacific Ocean (Lewison et al. 2004). They have been known to ingest longline hooks used to catch tuna and swordfish (Davenport and Balazs 1991, Skillman and Balazs 1992, Grant 1994, Work and Balazs 2002).

Incidental capture of leatherbacks by the north Pacific high seas driftnet fleet, which targets squid and tuna, was also a source of mortality during the 1980s and early 1990s (Eckert 1993). In 2001, NMFS prohibited drift gillnet fishing in California and Oregon from August 15 to November 15 from Monterey, California to 45ºN latitude within 13 nm (24 km) of the coast. This ruling was necessary to avoid the likelihood that this fishery would jeopardize the continued existence of the leatherback turtle population in the Pacific as leatherbacks annually migrated through this area (NOAA 2001).

Environmental contamination from coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased underwater noise, and boat traffic can degrade marine habitats used by marine turtles. The development of marinas and docks in inshore waters can negatively impact nearshore habitats. Fueling facilities at marinas can sometimes discharge oil, gas, and sewage into sensitive estuarine and coastal habitats. An increase in the number of docks built may also increase boat and vessel traffic. Sea turtles swimming or feeding at or just beneath the surface of the water are particularly vulnerable to boat and vessel strikes, which can result in serious propeller injuries and death.

Marine debris is a continuing contaminant problem for marine turtles. Marine turtles living in the open ocean commonly ingest or become entangled in marine debris (e.g., tar balls, plastic bags, plastic pellets, balloons, and ghost fishing gear) as they feed along oceanographic fronts, where debris and their natural food items converge. This is especially problematic for sea turtles that spend all or significant portions of their life cycle in the open ocean (e.g., leatherbacks, juvenile loggerheads, and juvenile green turtles).

Investigation of clutch hatching success suggests that the leatherback turtle has lower hatching success levels than other sea turtles. Reasons for this condition are unknown. Excessive nest predation of eggs and new hatchlings by native and nonnative predators and degradation of foraging habitats are primary natural mortality factors. Predators of eggs and hatchlings include several species of mammals, birds, invertebrates, and fish. Eggs and hatchlings have high mortality rates, but as the survivors grow, natural mortality declines markedly.

Sea Turtle Hearing

Sea turtles do not have an external ear pinnae or eardrum. Instead, they have a cutaneous layer and underlying subcutaneous fatty layer that function as a tympanic membrane (TM). The subcutaneous fatty layer receives and transmits sounds to the middle ear and into the cavity of the inner ear (Ridgway et al. 1969). Sound also arrives by bone conduction through the skull. Sound arriving at the inner ear via the columella (homologous to the mammalian stapes or stirrup) is transduced by the bones of the middle ear. Sea turtle auditory sensitivity is not well studied, though a few preliminary investigations suggest that it is limited to low frequency bandwidths, such as the sounds of waves breaking on a beach. The role of underwater low-frequency hearing in sea turtles is unclear. It has been suggested that sea turtles may use acoustic signals from their environment as guideposts during migration and as a cue to identify their natal beaches (Lenhardt et al. 1983).

Lenhardt et al. (1983) applied audiofrequency vibrations at 250 hertz (Hz) and 500 Hz to the heads of loggerheads and Kemp's ridleys submerged in salt water to observe their behavior, measure the attenuation of the vibrations, and assess any neural-evoked response. These stimuli (250 Hz, 500 Hz) were chosen as representative of the lowest sensitivity area of marine turtle hearing (Wever 1978). At the maximum upper limit of the vibratory delivery system, the sea turtles exhibited abrupt movements, slight retraction of the head, and extension of the limbs in the process of swimming. Lenhardt et al. (1983) concluded that bone-conducted hearing appears to be a reception mechanism for at least some of the sea turtle species, with the skull and shell acting as receiving surfaces. Finally, sensitivity even within the optimal hearing range was low as threshold detection levels in water are relatively high at 160 to 200 decibels referenced to one micro Pascal at a distance of one meter (dB re 1 µPa-m), which is the standard reference measure for underwater sound energy in this regard; Lenhardt 1994).

Ridgway et al. (1969) used aerial and mechanical stimulation to measure the cochlea in three specimens of green turtle, and concluded that they have a useful hearing span of perhaps 60 to 1,000 Hz, but hear best from about 200 Hz up to 700 Hz, with their sensitivity falling off considerably below 200 Hz. The maximum sensitivity for one animal was at 300 Hz, and for another was at 400 Hz. At the 400 Hz frequency, the green turtle's hearing threshold was about 64 dB in air (approximately 126 dB in water). At 70 Hz, it was about 70 dB in air (approximately 132 dB in water). We may be able to extrapolate this data to pertain to all hard-shell sea turtles (i.e., the olive ridley, green, loggerhead, hawksbill, and Kemp's ridley turtles). No audiometric data are available for the leatherback turtle, but based on other sea turtle hearing capabilities, they probably also hear best in the low frequencies.

For exposures to impulsive sound, a recent study on the effects of air guns on sea turtle behavior also suggests that sea turtles are most likely to respond to low-frequency sounds (McCauley et al. 2000). Green and loggerhead sea turtles will avoid air-gun arrays at 2 km and at 1 km, with received levels of 166 dB re 1 µPa-m and 175 dB re 1 µPa, respectively (McCauley et al. 2000). The sea turtles' response was consistent: above a level of about 166 dB re 1 µPa, the sea turtles noticeably increased their swimming activity. Above 175 dB re 1 µPa, their behavior became more erratic, possibly indicating that they were agitated (McCauley et al. 2000).

Currently it is believed that the range of maximum sensitivity for sea turtles is 200 to 800 Hz, with an upper limit of about 2,000 Hz (Lenhardt 1994, Moein et al. 1994). Hearing below 80 Hz is less sensitive but still potentially usable to the animal. Green turtles are most sensitive to sounds between 200 and 700 Hz, with peak sensitivity at 300 to 400 Hz (Ridgway et al. 1997). They possess an overall hearing range of approximately 60 to 1,000 Hz (Ridgway et al. 1969). Juvenile loggerhead turtles hear sounds between 250 and 1,000 Hz and, therefore, often avoid low-frequency sounds (Bartol et al. 1999). Finally, sensitivity even within the optimal hearing range is apparently low—threshold detection levels in water are relatively high at 160 to 200 dB re 1 µPa-m (Lenhardt 1994). Given the lack of audiometric information for leatherback turtles, the potential for temporary threshold shifts among leatherback turtles

must be classified as unknown but would likely follow those of other sea turtles. In terms of sound emission, nesting leatherback turtles produce sounds in the 300 to 500 Hz range (Mrosovsky 1972).

Mid-Frequency and High-Frequency Sound Sources

The lowest center frequency of any mid-frequency sonar proposed for use in ASW training (the AN/SQS-53) operates at 3,500 Hz. The best available information indicates that sea turtles hear in the range of 60 Hz to 2,000 Hz with best sensitivity between 200 to 800 Hz (Ridgway et al. 1969, Lenhardt 1994), which is well below the center operating frequency of any sonar proposed for use in the TMAA. Hearing sensitivity is low, even within the sea turtle's optimal hearing range, requiring received levels as high as 160 to 200 dB re 1 µPa for the sound to be heard (Lenhardt 1994). The nominal source level of the AN/SQS-53 sonar would attenuate below the upper end of this required received level within 175 meters of the ship. Because the remaining mid-frequency and high-frequency sources (Table 2-4 and 2-5, Section 2.5.2.1 Sonars Used in the TMAA) have lower source levels, are above the known hearing range of sea turtles, and because high levels of received sound are required for perception to occur, it is not likely that auditory impacts would occur from the use of mid-frequency and high-frequency sources during training in the TMAA.

Any potential role of long-range acoustical perception in sea turtles has not been studied. The concept of sound masking (the ability of one sound to make the ear incapable of perceiving another) is difficult, if not impossible, to apply to sea turtles. The best available science however, suggests that sea turtles cannot hear the mid- and high-frequency sound sources proposed for use in the TMAA.

3.7.1.2 Current Requirements and Practices

As summarized in Chapter 5, the comprehensive suite of protective measures and standard operating procedures (SOPs) implemented by the Navy to reduce impacts to marine mammals also serves to mitigate potential impacts on sea turtles. In particular, personnel and watchstander training, establishment of marine mammal exclusion zones for at-sea explosions, and pre- and post-exercise surveys all serve to reduce or eliminate potential impacts of Navy activities on sea turtles that may be present in the vicinity.

3.7.2 Environmental Consequences

As noted in Section 3.7.1, the ROI for sea turtles is the TMAA, which is more than 12 nm (22 km) from the closest point of land. As such, this section distinguishes between U.S. territorial seas (shoreline to 12 nm) and nonterritorial seas, (seaward of 12 nm) for the purposes of applying the appropriate regulations (National Environmental Policy Act [NEPA] or Executive Order [EO] 12114) to analyze potential environmental effects. Environmental effects in the open ocean beyond the U.S. territorial seas are analyzed in this EIS/OEIS pursuant to EO 12114.

3.7.2.1 Regulatory Framework

This EIS/OEIS analyzes potential effects to the leatherback turtle in the context of the ESA, NEPA, and EO 12114. For purposes of ESA compliance, effects of the action were analyzed to make the Navy's determination of effect for listed species (i.e., no effect or may affect). The definitions used in making the determination of effect under Section 7 of the ESA are based on the USFWS and NMFS *Endangered Species Consultation Handbook* (USFWS and NMFS 1998).

"No effect" is the appropriate conclusion when a listed species will not be affected, either because the species will not be present or because the project does not have any elements with the potential to affect the species. "No effect" does not include a small effect or an effect that is unlikely to occur.

If effects are insignificant (in size) or discountable (extremely unlikely), a "may affect" determination is appropriate. Insignificant effects relate to the magnitude or extent of the impact (that is, they must be small and would not rise to the level of a take of a species). Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. These factors were also considered in determining the significance of effects under the NEPA and EO 12114.

3.7.2.2 Approach to Analysis

Assessment Methods and Data Used

The Navy used a screening process to identify aspects of the Proposed Action that could act as stressors to sea turtles. Public and agency scoping comments, previous environmental analyses, previous agency consultations, laws, regulations, EOs, and resource-specific information were also evaluated. This process was used to focus the information presented and analyzed in the Affected Environment and Environmental Consequences sections (Sections 3.7.1 and 3.7.3) of this EIS/OEIS. Potential stressors to sea turtles include vessel movements (disturbance and collisions), aircraft overflights (disturbance), weapons firing and ordnance use (disturbance and strikes), explosions, and expended materials (ordnance-related materials, targets, and marine markers).

As discussed in Section 3.2, Expended Materials, and Section 3.3, Water Resources, potential pollutants in sediments, water, and air would be released into the environment as a result of the alternatives. The analyses presented in those sections indicate that any increases in pollutants resulting from Navy training in the TMAA would be negligible and localized, and impacts would not be significant. Based on these analyses, water quality changes would have negligible effects on sea turtles. Accordingly, the effects of water quality changes on sea turtles are not addressed further in this EIS/OEIS.

Data Sources

A systematic review of relevant literature and data was conducted of both published and unpublished sources. The following types of documents were used in the assessment: journals, books, periodicals, bulletins, Department of Defense (DoD) operations reports, theses, dissertations, endangered species recovery plans, species management plans, and other technical reports published by government agencies, private businesses, and consulting firms. The scientific literature was also consulted during the search for geographic location data (geographic coordinates) on the occurrence of sea turtles within the TMAA.

Sea Turtle Density

Given leatherback turtles have seldom been encountered in the GOA (19 documented occurrences in 47 years; Hodge and Wing 2000, DoN 2006), there is no data available and no density estimates for leatherback turtles in the TMAA. Extrapolation of numbers from temperate waters where numerical estimates have been made is not a valid approach given the cold waters of the GOA.

Sound in the Water

The acoustic abilities of marine species are important in communicating with others of their species, navigating, foraging, and avoiding predators. Human activities that affect their hearing could have adverse consequences for their survival and recovery. The approach to estimating the potential acoustic effects of Anti-Submarine Warfare (ASW) training activities in the TMAA on marine species uses methods that were developed for the Navy's Hawaii Range Complex Final EIS/OEIS in cooperation with the National Oceanic and Atmospheric Administration (NOAA) (DoN 2008).

As discussed previously in Sea Turtle Hearing, effects on leatherback turtles are not likely from the use of mid-frequency or high-frequency sound sources given that all available information indicates the

leatherback turtle hearing range is likely well below those frequencies. Acoustic masking of leatherback hearing should not occur as a result of the proposed use of the sources in those mid- and high-frequency ranges. Under ESA, use of sonar during training activities in the TMAA may effect leatherback turtles since it is possible that they may be exposed to sonar although not perceive it via hearing mechanisms.

Consideration of a physiological or stress response as a result of the proposed training activities must be discussed given the possible duration of the combined (exercise) activities (a maximum of 21 days). Although an individual training activity (such as an anti-submarine tracking exercise) may be hours in duration, the participants and activities are dispersed in the TMAA, the majority of sources are generally active only intermittently once or twice each minute, the sources have a small range of effect based on the hearing sensitivity of a sea turtle, and the sources are almost always moving rapidly (in relation to a sea turtle). Based on the discussion and citations provided in Section 3.7.1.1, leatherback turtles are not expected to be able to perceive the sounds from mid- and high-frequency sound sources and, given the likely short duration of any exposure to these sources, there should be no physiological or stress response as a result of their use in the TMAA.

Further discussion of potential effects from use of mid-frequency and high-frequency sound sources is not carried through in the analysis of the various alternatives for sea turtles.

At-Sea Explosions

Ordnance cannot be released and explosives cannot be detonated until the target area is determined to be clear. Training activities are halted immediately if cetaceans, pinnipeds, or sea turtles are observed in the target area. Training activities are delayed until the animal clears the target area. All observers are in continuous communication to be able to immediately halt training activities. The event can be delayed as necessary to ensure the target area is clear. If the area cannot be cleared, the operation is relocated or canceled. These practices lower the risk of harming leatherback turtles.

The lead time to set up and clear the impact area before an event using explosives takes place may be 30 minutes to several hours. There will, therefore, be a long period of area monitoring before any detonation or live-fire event begins.

Criteria and thresholds for estimating the impacts to leatherback turtles from a single at-sea explosion event were determined from information on marine species used for the environmental assessments for the two Navy ship-shock trials: the *Seawolf* Final EIS (DoN 1998) and the *Churchill* Final EIS (DoN 2001). During the analysis of the effects of explosions on marine mammals and sea turtles conducted by the Navy for the *Churchill* EIS, analysts compared the injury levels reported by these experiments to the injury levels that would be predicted using the modified-Goertner method and found them to be similar (DoN 2001, Goertner 1982). While the criteria and thresholds for injury and harassment summarized in Table 3.7-1 were developed based on data from marine mammals, extrapolation from human and marine mammal data to sea turtles may be inappropriate given the morphological differences between the auditory systems of mammals and turtles. However, they are also used for sea turtles because no other criteria exist.

The criteria for non-injurious harassment include acoustic annoyance and physical discomfort (Viada et al. 2007). Temporary threshold shift (TTS) is the criterion for acoustic annoyance; TTS is a temporary, recoverable, loss of hearing sensitivity (NMFS 2001, DoN 2001). There are two criteria for TTS: (1) 182 dB re 1 squared micropascal-second (μPa^2-s) maximum Energy Flux Density Level (EL) level in any 1/3-octave band at frequencies greater than 100 Hz for sea turtles, and (2) 12 pounds per square inch (psi) peak pressure. Navy policy is to use a peak pressure level of 23 psi as a criterion for explosive charges less than 2,000 lb (900 kg) and a peak pressure level of 12 psi as a criterion for explosive charges larger than 2,000 lb. It was introduced to provide a safety zone for TTS when the explosive or the animal

approaches the sea surface (for which case the explosive energy is reduced but the peak pressure is not). In addition to acoustic annoyance, non-injurious harassment may also include physical discomfort and tactile detection, particularly in areas around the eyes, mouth, external nares, and vent (Viada et al. 2007).

Table 3.7-1: Summary of Criteria and Acoustic Thresholds for at-Sea Explosion Impacts to Sea Turtles

Impact to Marine Mammal	Criterion	Threshold
Level A harassment Mortality	Onset of severe lung injury	Goertner Modified Positive Impulse indexed to 31 psi-ms
Injury	Tympanic membrane (TM) rupture Onset of slight lung injury	50 percent rate of rupture 205 dB re 1 μPa^2-s (Energy Flux Density) Goertner Modified Positive Impulse Indexed to 13 psi-ms
Level B harassment Noninjury	Temporary threshold shift (TTS)	182 dB re 1 μPa^2-s maximum Energy Flux Density level in any 1/3-octave band at frequencies above 100 Hz for sea turtles
Dual criteria	Onset TTS	23 psi peak pressure level (for small explosives)

psi-ms = pounds per square inch-milliseconds, dB = decibel, μPa^2-s = squared micropascal-second, Hz = hertz

Two criteria are used for injury: onset of slight lung hemorrhage and 50 percent eardrum (TM) rupture. These criteria are considered indicative of the onset of injury. The threshold for onset of slight lung injury is calculated for a small animal (a dolphin calf weighing 27 lb [12 kg]), and is given in terms of the "Goertner modified positive impulse," indexed to 13 psi-millisecond (ms) (DoN 2001). This threshold is conservative since the positive impulse needed to cause injury is proportional to animal mass, and therefore, larger animals require a higher impulse to cause the onset of injury. The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM rupture); this is stated in terms of an EL value of 205 dB re 1 μPa^2-s. The criterion reflects the fact that TM rupture is not necessarily a serious or life-threatening injury, but is a useful index of possible injury that is well correlated with measures of permanent hearing impairment (e.g., Ketten 1998), and indicates a 30 percent incidence of permanent threshold shift [PTS] at the same threshold. Another slight injury that may result from at-sea explosions includes hemorrhage of the gastrointestinal tract. This is caused by excitation of radial oscillations of small gas bubbles normally present in the intestine. Hemorrhage of the gastrointestinal tract is not expected to be debilitating, and a sea turtle would be expected to recover on its own (Viada et al. 2007).

The criterion for mortality for marine mammals used in the *Churchill* Final EIS is "onset of severe lung injury." In the absence of analogous data for sea turtles, the criteria developed for marine mammals are also applied to sea turtles. This is conservative for marine mammals in that it corresponds to a 1 percent chance of mortal injury, and yet any animal experiencing onset severe lung injury is counted as a lethal exposure. The threshold is stated in terms of the Goertner (1982) modified positive impulse with value "indexed to 31 psi-ms." Since the Goertner approach depends on propagation, source/animal depths, and animal mass, the actual impulse value corresponding to the 31 psi-ms index is a complicated calculation. Again, to be conservative, the *Churchill* analysis used the mass of a dolphin calf (27 lb [12 kg]), so that the threshold index is 30.5 psi-ms. Gastrointestinal tract injuries are associated with lung hemorrhage and would be expected to include contusions with ulcerations throughout the tract, ultimately resulting in tract ruptures. Mortality is highly likely under these conditions (Viada et al. 2007). Lethal injuries may also result from shock waves with high peak pressure. These high peak pressure shock waves may result in

concussive brain damage; cranial, skeletal, or shell fractures; hemorrhage; or massive inner ear trauma, leading either directly or indirectly to mortality (Viada et al. 2007).

Weapons Firing Disturbance

A gun fired from a vessel on the surface of the water propagates a blast wave away from the gun muzzle. As the blast wave hits the water, sound is carried into the water in proportion to the blast strike. Propagating energy is transmitted into the water in a finite region below the gun. The fraction of sound transmitted from air to water depends on the angle at which the sound approaches the air-water interface. The greater the angle, the less transmission of sound from air to water. This critical angle (about 13°, as measured from the vertical) can be calculated to determine the region of transmission in relation to a vessel and gun (DoN 2006). When the critical angle is exceeded, all of the acoustic energy is reflected from the air-water interface and does not enter the water column.

The largest proposed shell size for training activities is a 5-in shell. This will produce the greatest pressure of all ammunition used in the study area. All analysis was done using the 5-in shell as a source of produced and transmitted pressure, with the recognition that smaller ammunition sizes would have lesser impacts.

In June 2000, the Navy collected a series of pressure measurements during the firing of a 5-in gun. Average pressure measured approximately 200 dB with reference pressure of one micropascal (200 dB re 1 µPa) at the point of the air and water interface. Based on these values, down-range peak pressure levels were calculated to be less than 186 dB re 1 µPa at 100 m (DoN 2000), and down-range pressure levels decreased with increasing distance. The rapid dissipation of the sound pressure wave, the low potential for occurrence of leatherback turtles in the TMAA, and the protective measures implemented by the Navy (see Chapter 5 for details) to detect leatherback turtles in an area prior to implementing training activities would result in the gun muzzle blasts having no effect on leatherback turtles. This topic is not addressed further in the analyses of effects on sea turtles.

3.7.2.3 No Action Alternative

Under the No Action Alternative, baseline levels of activities would remain unchanged from current conditions. Leatherback turtles would have the potential to be affected by vessel movements, aircraft overflights, ordnance strikes, explosions, and expended materials.

Vessel Movements

Training activities within the study area involve maneuvers by various types of surface vessels and submarines (collectively referred to as vessels). Vessel movements have the potential to affect leatherback turtles by directly striking or disturbing individual animals. The probability of vessel and leatherback turtle interactions depends on factors such as the presence or absence and density of leatherback turtles; numbers, types, and speeds of vessels; duration and spatial extent of activities; and protective measures implemented by the Navy.

The number of Navy vessels participating in training under the No Action Alternative is 23, consisting of 4 military vessels and up to 19 contracted vessels and boats. Although Navy vessels are capable of much faster speeds, specific training activities will generally be at speeds in the range of 10 to 14 knots (kts) (18 to 26 kilometers per hour [km/h]). Training activities are widely dispersed throughout the TMAA, which encompasses 42,146 square nm (nm^2) (145,482 square km [km^2]) of surface and subsurface ocean.

Disturbance from Vessel Movement

The ability of sea turtles to detect approaching vessels via auditory or visual cues would be expected based on knowledge of their sensory biology (Bartol and Musick 2003, Ketten and Bartol 2006, Bartol

and Ketten 2006, Levenson et al. 2004). Little information is available on how sea turtles respond to vessel approaches. Hazel et al. (2007) reported that greater vessel speeds increased the probability that sea turtles would fail to flee from an approaching vessel. Sea turtles fled frequently in encounters with a slow-moving (2.2 kts) (4.4 km/h) vessel, but infrequently in encounters with a moderate-moving (5.9 kts) (10.6 km/h) vessel, and only rarely in encounters with a fast-moving (10.3 kts) (18.5 km/h) vessel. It is difficult to differentiate whether a sea turtle reacts to a vessel due to the produced sound, the presence of the vessel itself, or a combination of both. As discussed previously in Sea Turtle Hearing, sea turtles have highest sensitivity to sounds between approximately 200 to 800 Hz, with an upper limit of 2,000 Hz (Ridgway et al. 1969, Lenhardt 1994, Bartol et al. 1999, Ketten and Bartol 2006). Although it is difficult to determine whether sea turtle response to vessel traffic is visual or auditory in nature, it is assumed sea turtles can hear approaching vessels given their hearing range.

Leatherback turtles exposed to the general disturbance associated with a passing Navy vessel could exhibit short-term behavioral responses. In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel movement under the No Action Alternative may affect leatherback turtles.

Vessel Collisions

Vessel collisions or strikes have the potential to affect leatherback turtles in the TMAA. Sea turtles swimming or feeding at or just beneath the surface of the water are particularly vulnerable to a vessel strike. Sea turtles struck by vessels could be unharmed, injured, or killed. Collisions between vessels and leatherback turtles are possible, but have a low potential for occurrence. The probably extreme low density for leatherback turtles, low number of steaming hours over a large area (42,146 nm^2 [144,556 km^2]), and Navy standard lookouts meant to reduce the collision potential would combine to limit the likelihood of vessel-sea turtle collisions.

As noted above, there is little information available on how sea turtles respond to vessel approaches. Hazel et al. (2007) found that sea turtles reacted to approaching vessels in a variety of ways. Benthic sea turtles launched upwards at a shallow angle and began swimming. The majority of the sea turtles swam away from the vessel, while some swam along the vessel's track, and some crossed in front of the vessel's track before swimming away. Sea turtle reaction time was greatly dependent on the speed of the vessel; sea turtles were able to react faster to slower moving vessels than to faster moving vessels. Sea turtle reactions to vessels elicited short-term responses.

Human disturbance to wild animals, such as vessel movement, may elicit similar reactions to those caused by natural predators (Gill et al. 2001, Beale and Monaghan 2004). Behavioral responses may also be accompanied by a physiological response (Romero 2004), although this is very difficult to study in the wild. Immature Kemp's ridley turtles have shown physiological responses to the acute stress of capture and handling through increased levels of corticosterone (Gregory and Schmid 2001). In the short term, exposure to stressors results in changes in immediate behavior (Frid 2003). For sea turtles, this can include intense behavioral reactions such as biting and rapid flipper movement (Gregory and Schmid 2001). Repeated exposure to stressors, including human disturbance such as vessel disturbance and anthropogenic sound, can result in negative consequences to the health and viability of an individual or population. Chronic stress can result in decreased reproductive success (Lordi et al. 2000, Beale and Monaghan 2004), decreased energy budget (Frid 2003), displacement from habitat (Sutherland and Crockford 1993), and lower survival rates of offspring (Lordi et al. 2000). Although this study related to natural induced stressors, similar physiological changes may result from other types of stressors such as anthropogenic disturbance. At this time, it is unknown what the long-term implications of chronic stress may be on sea turtle species.

The Navy's SOPs include a number of measures that will help prevent a collision between a naval vessel and a leatherback turtle (see Chapter 5). Navy vessels use lookouts 24 hours a day, who serve to alert the bridge to any and all objects in the water, including sea turtles. Ships and surfaced submarines use caution and operate at safe speeds consistent with weather and sea state conditions. Ships and submarines will maneuver to avoid a collision with a sea turtle to the extent possible, with safety of the vessel paramount. The combination of the low initial probability of collision with a leatherback turtle and the procedures to avoid such an event makes it extremely unlikely a ship would collide with a leatherback turtle. In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel strikes under the No Action Alternative may affect leatherback turtles.

Aircraft Overflights

Under the No Action Alternative, fixed-wing aircraft overflights associated with 300 sorties would occur above the TMAA. Most aircraft overflights would occur over the TMAA at elevations in excess of 15,000 ft (915 m). All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m). There would be 32 training events that may involve helicopter flights conducted over water.

Aircraft overflights produce noise, and some of this sonic energy would be transmitted into the water. Sea turtles could be exposed to noise associated with fixed-wing aircraft overflights and helicopter activities while at the surface or while submerged. In addition, low-flying aircraft passing overhead could create a visual shadow effect that could induce a reaction in sea turtles.

It is difficult to differentiate between reactions that sea turtles may experience to the presence of aircraft and reactions to sound. Based on information on their sensory biology as discussed in Sea Turtle Hearing (Ridgway et al. 1969, Lenhardt 1994, Bartol et al. 1999, Bartol and Musick 2003, Ketten and Bartol 2006), sound from low-flying aircraft could be heard by a sea turtle at or near the surface. Exposures to elevated noise levels that are associated with current activities are brief and infrequent, based on the transitory and dispersed nature of the overflights. Sound exposure levels are relatively low because sea turtles spend only 3 to 6 percent of the time at the sea surface and because most of the overflights would be above 15,000 ft. In addition, overflights do not generate underwater sound levels that result in harm to sea turtles (Eller and Cavanagh 2000, Laney and Cavanagh 2000). Hazel et al. (2007) suggested that green turtles rely more on visual cues than auditory cues when reacting to approaching water vessels. This suggests that sea turtles might not respond to aircraft overflights based on noise alone.

Leatherback turtles exposed to aircraft overflights that occur under the No Action Alternative may exhibit no response, or may exhibit behavioral reactions such as quick diving. Any behavioral avoidance reaction would be short-term and would not permanently displace animals or result in physical harm. Overflights are not expected to result in chronic stress because it is unlikely that individual animals would be repeatedly exposed to low-altitude overflights. In accordance with EO 12114, harm to leatherback turtles from aircraft overflights in nonterritorial seas would be possible but unlikely. In accordance with the ESA, aircraft overflights under the No Action Alternative may affect leatherback turtles.

At-Sea Explosions

Explosions that would occur in the No Action Alternative in the TMAA would result from training exercises that use explosive ordnance, including bombs (BOMBEX), high explosive (HE) rounds (Gunnery Exercise [GUNEX]) as identified in Table 2-8. At-sea explosions conducted under the No Action Alternative have the potential to adversely affect sea turtles in the study area by causing temporary behavioral effects, sub-lethal or lethal injuries, or direct mortality.

Missiles used in air to air training events at sea, although part of a live fire event, are designed to detonate in the air and do not constitute an at-sea explosion occurring in water as analyzed in this document.

However, the same factors that would limit other adverse effects to sea turtles would result in a low potential for impacts from explosions. These include the relatively low potential for sea turtles to occur in the study area, the limited number of training activities using explosive ordnance over a large area, and consistent implementation of Navy resource protection measures.

Under the No Action Alternative, approximately 48 live bombs may be used during a BOMBEX. During Surface-to-Surface (S-S) GUNEX, 30 5-in rounds and 10 76-millimeter (mm) rounds could be fired each year during training activities under the continuing activities of the No Action Alternative. Their use would occur in all areas of the TMAA.

An analysis of potential impacts from at-sea explosions using acoustic modeling could not be conducted for leatherback turtles, given there is no data regarding the abundance or distribution in the Pacific (NMFS and USFWS 1998c) and no known density or information available to derive an estimate for the number of leatherback turtles in the GOA or in the TMAA. In analyses undertaken for similar actions at other locations, modeling to predict potential impacts required that the zone of influence resulting from each explosion or detonation be multiplied by the sea turtle density to assess the potential for and number of impacts likely (see Sea Turtle Hearing Section and Section 3.7.2.2 for sea turtle-specific thresholds and Section 3.8, Marine Mammals, for a full description of the modeling and methods). Modeling efforts in these cases are completed as if no mitigation measures were in effect. The purpose of this is to model without consideration for reduction in the predicted impact numbers as a result of standard mitigations (regarding standard mitigations, see Current Requirements and Practices Section).

Given indications there are very low numbers of leatherback turtles present in the TMAA, mathematical modeling based on the density of sea turtles in the area (if available) would result in less than one predicted exposure annually (based on modeling of other species having magnitudes higher densities). However, there remains a possibility there could be an exposure of a leatherback to acoustic or pressure waves from at-sea explosions. Based on this possibility, under the No Action Alternative, the explosions and detonations that would take place in the TMAA may affect leatherback turtles. No sea turtle mortalities would be expected under this alternative.

In accordance with EO 12114, harm to leatherback turtles from explosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of explosive ordnance in the TMAA under the No Action Alternative may affect leatherback turtles.

Expended Materials

The Navy expends a variety of materials during training exercises. Under the No Action Alternative, 15,982 expendable items may be used. The types and quantities of materials expended and information regarding fate and transport of these materials within the marine environment are discussed in Section 3.2 (Expended Materials), and Section 3.3 (Water Resources). The analyses in these sections determined that most expended materials rapidly sink to the seafloor where they become encrusted by natural processes or are incorporated into the seafloor, with no substantial accumulations in any particular area and no significant negative effects to water quality or marine benthic communities. Given that materials expended during training do not remain at the surface and are generally used in areas where the water depth is beyond that of foraging sea turtles, it is unlikely expended materials would affect sea turtles.

Sea turtles of all sizes and species are known to ingest a wide variety of marine debris, which they might mistake for prey. Plastic bags and plastic sheeting are most commonly swallowed by sea turtles, but balloons, styrofoam beads, monofilament fishing line, and tar are also known to be ingested (National

Research Council [NRC] 1990). Most materials expended during Navy training are larger in size than the marine debris ingested by sea turtles. Marine debris can pass through the digestive tract and be voided naturally without causing harm, or it can cause sublethal or lethal effects (Balazs 1985). Sublethal effects include nutrient dilution, which occurs when nonnutritive debris displaces nutritious food in the gut, leading to slow growth or reduced reproductive success (McCauley and Bjorndal 1999).

Lutz (1997) found that hungry sea turtles will actively seek and consume marine debris if other food is not available. In most cases, this debris passed through the gut within a few days, but latex was found to take up to 4 months to clear the intestinal system. While ingestion of marine debris has been linked to sea turtle mortalities, sublethal effects are more common (NRC 1990, McCauley and Bjorndal 1999).

Ordnance-Related Materials

Ordnance-related materials include nonexplosive training rounds and shrapnel from explosive rounds. Under the No Action Alternative, 15,706 items of ordnance or related materials would be expended. The solid materials of high metal content quickly sink through the water column and into the seafloor in the TMAA where they would generally be beyond the reach of foraging leatherback turtles (although leatherbacks have been known to dive to a depth of 1,200 m [DoN 2006]).

Leatherbacks feed throughout all zones of the water column (Davenport 1988, Eckert et al. 1989, Grant and Ferrell 1993, Salmon et al. 2004, James et al. 2005). Prey is predominantly gelatinous zooplankton such as jellyfish and tunicates (Grant and Ferrell 1993, Bjorndal 1997, James and Herman 2001, Salmon et al. 2004), and as discussed in Species Accounts and Life History, they typically do not feed in the benthic environment. Therefore, although leatherbacks could reach ordnance-related materials resting on the bottom at depths up to 1,000 m, they are unlikely to ingest it.

Ingestion of expended ordnance is not expected to occur in the water column because ordnance quickly sinks. Leatherbacks would not be expected to ingest ordnance expended under the No Action Alternative because they do not typically feed in the benthic environment. In accordance with EO 12114, harm to leatherback turtles from expended materials in nonterritorial seas would not be likely to occur. In accordance with the ESA, ordnance-related materials under the No Action Alternative may affect leatherback turtles.

Nonexplosive Ordnance Use

Current Navy training activities in the TMAA include firing a variety of weapons that employ nonexplosive training rounds, including inert bombs, missiles, naval gun shells, cannon shells, and small-caliber ammunition. These materials are used in the open ocean beyond 12 nm (22 km) and represent potential stressors to sea turtles. Ordnance strikes have the potential to injure or kill sea turtles swimming or feeding at or just beneath the water surface.

Approximately 10,454 nonexplosive ordnance rounds would be used in the TMAA under the No Action Alternative. Given the few number of leatherback turtle likely in the TMAA, the large area encompassed by the training activities, and area clearance procedures, the potential for leatherback turtles to be struck by ordnance is very low.

In accordance with EO 12114, harm to leatherback turtles from nonexplosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, nonexplosive ordnance strikes under the No Action Alternative may affect leatherback turtles.

Target-Related Materials

At-sea targets used in the TMAA could range from high-technology, remotely operated airborne and surface targets (such as airborne drones) to low-technology, floating, at-sea targets (such as inflatable targets) and airborne, towed banners. Many of the targets are designed to be recovered for reuse and are not destroyed during training. There are 252 target related items used under the No Action Alternative and all but eight of these would be recovered. The expendable targets used in the study area under this alternative are the Tactical Air Launched Decoy (TALD), BQM-74E, and Killer Tomato. When not recovered after use, these units are large and remain in large pieces when they sink to the bottom after use. Because of this characteristic, they present no ingestion hazard to sea turtles.

In addition to expendable target use, MK-58 marine markers or LUU-2B/B flares are used which produce chemical flames and surface smoke. They are used in training exercises to mark a surface position to simulate divers, vessels, and points of contact on the surface of the ocean. The smoke dissipates in the air and has little effect on the marine environment. The marker burns similar to a flare, producing a flame until all burn components have been used. While the light generated from the marker is bright enough to be seen up to 3 mi (4.8 km) away in ideal conditions, the light either reflects off the water's surface or enters the water and attenuates in brightness over depth. Because they spend only three to six percent of time on the sea surface, it would be extremely unlikely that leatherback turtles would be affected by the light from the marker.

In accordance with EO 12114, harm to leatherback turtles from target use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of target-related materials under the No Action Alternative may affect leatherback turtles.

Chaff

As detailed in Section 3.2.1.1, chaff consists of aluminum-coated polymer fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor. An extensive review of literature, combined with controlled experiments, revealed that chaff use poses little risk to the environment or animals (U.S. Air Force 1997, Naval Research Laboratory 1999, Arfsten et al. 2002, Farrell and Siciliano 2007). The materials in chaff are generally nontoxic except in quantities significantly larger than those any animal could reasonably be exposed to from normal usage. Particulate tests concluded that the concern about chaff fibers breaking down into respirable particle sizes is not a significant issue. Experiments have shown that animals should not suffer toxic or physical effects from chaff ingestion (U.S. Air Force 1997, Naval Research Laboratory 1999). It is likely that due to the small size of chaff, if ingested, it would pass through the digestive tract and be voided naturally without causing harm, sublethal, or lethal effects. Under the No Action Alternative, ingestion of chaff, although very unlikely, could occur but any effects are likely insignificant and discountable. In accordance with the ESA, use of chaff under the No Action Alternative may affect leatherback turtles.

Entanglement

Entanglement in persistent marine debris threatens the survival of sea turtles in the eastern Pacific Ocean (NMFS and USFWS 1998a). Often, sea turtles that become entangled in debris or abandoned fishing gear cannot submerge to feed or surface to breathe. Those that do not starve or drown may lose a limb or attract predators with their struggling. Sea turtles can also become entangled in plastics and other buoyant and persistent synthetic debris discarded into the ocean (Balazs 1995, Carr 1987).

Although entanglement in military expended materials was not cited as a source of injury or mortality for any sea turtle in a large stranding database for Californian waters, there is a potential for sea turtles to become entangled in expended materials.

The greatest risk of entanglement occurs when expendable devices, primarily parachutes, are on or near the surface. Approximately 56 expendable devices employing parachutes are used annually under the No Action Alternative in the TMAA. Aircraft-launched sonobuoys, flares, and other expendable devices deploy nylon parachutes of varying sizes (e.g., the surface area is 1.5 square ft [ft^2] [0.1 square m {m^2}] to 3.5 ft^2 [0.3 m^2]). At water impact, the parachute lines and assembly is expended and sinks because all of the material is negatively buoyant. Other components of the expendable devices are metallic and will sink rapidly. Entanglement and the eventual drowning of a leatherback turtle in a parachute assembly would be unlikely because such an event would require the parachute to land directly on a leatherback turtle, or the leatherback turtle to swim into the parachute before it sinks.

The expended material accumulates on the ocean floor and is covered by sediments over time, reducing the potential for entanglement. If bottom currents are present, the canopy may billow and pose an entanglement threat to sea turtles with bottom-feeding habits. As described in Species Accounts and Life History, leatherback turtles have been recorded as diving to depths in excess of 1,200 m (3,937 ft) (DoN 2006) though spend the majority of time at depths less than 100m (328ft). With the general depth in the TMAA being over 1,000 m (3,281 ft), the probability of a leatherback turtle encountering a submerged parachute assembly is low, and the potential for accidental entanglement in the canopy or suspension lines is therefore discountable.

In accordance with EO 12114, harm to leatherback turtles from entanglement from military expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, entanglement from military expended materials under the No Action Alternative may affect leatherback turtles.

3.7.2.4 Alternative 1

Under Alternative 1, the level of activities in the TMAA would increase relative to the No Action Alternative. In addition to accommodating an increase in training activities currently conducted, Alternative 1 would also support an introduction of training activities to include training activities associated with ASW training.

Vessel Movements

Under Alternative 1, the number of vessels used in training events would increase from 23 under the No Action Alternative (current conditions) to 27 surface vessels plus 1 submarine; however, vessel movements would be widely dispersed throughout the area. This would be an increase of 17 percent over the No Action Alternative's current conditions.

Disturbance from Vessel Movement

The small increase in number of vessels over current conditions would not measurably increase potential effects to sea turtles. As described for the No Action Alternative, leatherback turtles exposed to the general disturbance associated with a passing Navy vessel could exhibit a short-term behavioral response such as fleeing. In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel movements under Alternative 1 may affect leatherback turtles.

Vessel Collisions

The types of vessel strike impacts to sea turtles under Alternative 1 would be the same as those described for the No Action Alternative. The increase of four surface vessels and one submarine over current conditions would not measurably change effects on sea turtles relative to the No Action Alternative.

In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel collisions under Alternative 1 may affect leatherback turtles.

Aircraft Overflights

Under Alternative 1, overflights associated with 300 sorties would occur above the TMAA annually. This would represent no change from No Action Alternative conditions. In addition there would be 59 training events that may involve helicopter flights conducted over water, an approximate 84 percent increase from the No Action Alternative. As with the other alternatives, most aircraft overflights would occur over the TMAA at elevations in excess of 15,000 ft (915 m). All fixed-wing aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m).

Exposures to elevated noise levels associated with Alternative 1 would be brief and infrequent, based on the transitory, dispersed nature of the overflights. Sound exposure levels are relatively low because sea turtles spend only three to six percent of the time at the sea surface, and most of the overflights would be above 15,000 ft.

As described for aircraft overflights under the No Action Alternative, sea turtles could exhibit no response, or may exhibit behavioral reactions such as quick diving. Any behavioral avoidance reaction would be short-term and would not permanently displace animals or result in physical harm. Overflights are not expected to result in chronic stress because it is extremely unlikely that individual animals would be repeatedly exposed to low-altitude overflights.

In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, aircraft overflights under Alternative 1 may affect leatherback turtles.

At-Sea Explosions

Under Alternative 1, approximately 72 bomb explosions would occur each year during training activities in the TMAA, which is a 52% increase over the No Action Alternative. There would also be 42 5-in rounds and 14 76mm rounds fired during S-S GUNEX, which is a 167% increase over the No Action Alternative.

In addition, 40 SSQ-110A Improved Extended Echo Ranging (IEER) sonobuoys could be used for the first time in the TMAA under Alternative 1 in association with ASW training. These sonobuoys contain an explosive component and could be used in all areas of the TMAA. In the very rare event that a leatherback sea turtle was in the vicinity of an IEER sonobuoy, remained undetected, and loitered in the vicinity until the 4.4-lb charge was detonated, the leatherback turtle could be exposed to noise and the pressure wave from the detonation. Monitoring and resource protection undertaken prior to any detonation of an IEER would reduce the likelihood of sea turtles being exposed to such detonations. Protective measures that are used during training activities to identify sea turtle presences and suspend detonation activities if a sea turtle should be spotted would make these effects discountable.

An analysis of potential impacts from at-sea explosions under Alternative 1 using acoustic modeling could not conducted for leatherback turtles. There is no data regarding the abundance or distribution in

the Pacific (NMFS and USFWS 1998c) and no known density or information available to derive an estimate for the number of leatherback turtles in the GOA or in the TMAA. In analyses undertaken for similar actions at other locations, modeling to predict potential impacts required that the zone of influence resulting from each explosion or detonation be multiplied by the sea turtle density to assess the potential for and number of impacts likely (see Sea Turtle Hearing Section and Section 3.7.2.2 for sea turtle-specific thresholds and Section 3.8, Marine Mammals, for a full description of the modeling and methods). The approach in prior modeling efforts were to model without consideration for reduction in the predicted impact numbers as a result of standard mitigations (regarding standard mitigations, see Current Requirements and Practices Section).

Given the low numbers of leatherback turtles likely present in the TMAA, modeling would likely result in a conclusion that there were no exposures in any event. However, without density information and modeling of potential impacts, there remains a possibility there could be an exposure of a leatherback to at-sea explosions. Based on this possibility, under Alternative 1, the explosions and detonations that would take place in the TMAA may affect leatherback turtles. No sea turtle mortalities would be expected under this alternative.

In accordance with EO 12114, harm to leatherback turtles from explosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of explosive ordnance in the TMAA under Alternative 1 may affect leatherback turtles.

Expended Materials

Ordnance-Related Materials

Under Alternative 1, a total of 19,101 items of ordnance or related materials would be expended. This is a 17 percent increase over current conditions. As described for the No Action Alternative, leatherback turtles would not be expected to be at risk from ingesting ordnance-related materials because they feed in the water column, not in the benthic environment. Because these materials sink rapidly and are encrusted on the seafloor, the potential to affect leatherbacks would be remote.

In accordance with EO 12114, harm to leatherback turtles from expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, ordnance-related materials under Alternative 1 may affect leatherback turtles.

Nonexplosive Ordnance Use

Approximately 12,987 nonexplosive ordnance rounds would be used in the TMAA annually under Alternative 1. This is a 20 percent increase from current conditions and includes including inert bombs, missiles, naval gun shells, cannon shells, and small-caliber ammunition. Ordnance is used in all areas of the TMAA. Given the few number of leatherback turtles likely in the TMAA, the large area encompassed by the training activities, and area clearance procedures, the potential for leatherback turtles to be struck by ordnance is very low.

In accordance with EO 12114, harm to leatherback turtles from nonexplosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, nonexplosive ordnance strikes under the Alternative 1 may affect leatherback turtles.

Target-Related Materials

At-sea targets used in the TMAA could range from high-technology, remotely operated airborne and surface targets (such as airborne drones) to low-technology, floating, at-sea targets (such as inflatable targets) and airborne, towed banners. Many of the targets are designed to be recovered for reuse and are not destroyed during training (i.e., Killer Tomato and BQM-74E). The expendable targets used in the

study area under this alternative are the Tactical Air Launched Decoy (TALD), BQM-74E, and Killer Tomato. When not recovered after use, these units are large and remain in large pieces when they sink to the bottom after use. Because of this characteristic, they present no ingestion hazard to sea turtles. Under Alternative 1, there would be 322 target-related materials expended.

As discussed for the No Action Alternative, the smoke and flames produced by the marine markers or flares dissipate in the air, having little effect on the marine environment. While the light generated from the marker is bright enough to be seen up to 3 mi (4.8 km) away in ideal conditions, the light either reflects off the water's surface or enters the water and attenuates in brightness over depth.

In accordance with EO 12114, harm to leatherback turtles from target use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of target-related materials under Alternative 1 may affect leatherback turtles.

Chaff

As detailed in Section 3.2.1.1 chaff consists of aluminum-coated polymer fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor. An extensive review of literature, combined with controlled experiments, revealed that chaff use poses little risk to the environment or animals (U.S. Air Force 1997, Naval Research Laboratory 1999, Arfsten et al. 2002, Farrell and Siciliano 2007). The materials in chaff are generally nontoxic except in quantities significantly larger than those any animal could reasonably be exposed to from normal usage. Particulate tests concluded that the concern about chaff fibers breaking down into respirable particle sizes is not a significant issue. Experiments have shown that animals should not suffer toxic or physical effects from chaff ingestion (U.S. Air Force 1997, Naval Research Laboratory 1999). It is likely that due to the small size of chaff, if ingested, it would pass through the digestive tract and be voided naturally without causing harm, sublethal, or lethal effects. Under Alternative 1, ingestion of chaff, although very unlikely, could occur but any effects are likely insignificant and discountable. In accordance with EO 12114, harm to leatherback turtles from use of chaff in nonterritorial seas would be unlikely. In accordance with the ESA, use of chaff under Alternative 1 may affect leatherback turtles.

Portable Undersea Tracking Range

The PUTR is a self-contained, portable, undersea tracking capability that employs modern technologies to support coordinated undersea warfare training for Forward Deployed Naval Forces (FDNF). PUTR will be available in two variants to support both shallow and deep water remote activities in keeping with Navy requirements to exercise and evaluate weapons systems and crews in the environments that replicate the potential combat area. The system will be capable of tracking submarines, surface ships, weapons, targets, and Unmanned Underwater Vehicles (UUVs) and distribute the data to a data processing and display system, either aboard ship, or at a shore site.

No area supporting a PUTR system has been identified. The transponders are not deployed on sensitive hard-bottom habitat, but rather on soft-bottom habitats. There would be direct impact to soft bottom habitat from the clump weight anchoring the transponder, however, this should have no impact on sea turtles. Cabling between the clump weight and the transponder is under tension and would not present an entanglement hazard to leatherback sea turtles. Upon completion of the exercise, the transponders are recovered, which eliminates any potential impacts associated with hazardous materials such as batteries and electronic components associated with the PUTR system. The clump weight is not recovered, and since it is composed of inert material, it is not a potential source of contaminants. Sediments stirred up by the clump weight anchor should only result in a temporary and localized turbidity. In accordance with EO

12114, harm to leatherback turtles from use of the PUTR in nonterritorial seas would be unlikely. In accordance with the ESA, use of the PUTR under Alternative 1 may affect leatherback turtles.

Entanglement

Under Alternative 1, use of parachuted expended devices (sonobuoys, flares, EMATT) would increase by 859 items as compared to the No Action Alternative. Changes in the use of targets and markers that are delivered using parachutes were provided under "Target-Related Materials." The greatest risk of entanglement occurs when expendable devices, primarily parachutes, are on or near the surface. Aircraft-launched sonobuoys, flares, and other expendable devices deploy nylon parachutes of varying sizes. At water impact, the parachute lines and assembly is expended and sinks because all of the material is negatively buoyant. Other components of the expendable devices are metallic and will sink rapidly. Entanglement and the eventual drowning of a leatherback turtle in a parachute assembly would be unlikely because such an event would require the parachute to land directly on a leatherback turtle, or the leatherback turtle to swim into the parachute before it sinks.

In accordance with EO 12114, harm to leatherback turtles from entanglement from military expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, entanglement from military expended materials under Alternative 1 may affect leatherback turtles.

3.7.2.5 Alternative 2

Implementation of Alternative 2 would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional separate summertime CSG exercise lasting up to 21 days within the ATA.
- Conduct a SINKEX in each summertime exercise (a maximum of two) in the TMAA.

Sea turtles would have the potential to be affected by vessel movements, aircraft overflights, sonar, weapons firing/nonexplosive ordnance use, explosive ordnance, and expended materials under Alternative 2.

Vessel Movements

Under Alternative 2, there may be up to 27 surface vessels and 1 submarine participating in training activities during two training periods. This alternative would increase by 17 percent the number of vessels relative to the No Action Alternative. Vessel movements would be widely dispersed throughout the TMAA.

Disturbance from Vessel Movement

The increase in the number of vessels would not measurably increase potential effects to sea turtles. Sea turtles exposed to the general disturbance associated with a passing Navy vessel could exhibit a short-term behavioral response such as fleeing. In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel disturbance under Alternative 2 may affect leatherback turtles.

Vessel Collisions

The types of vessel strike effects to sea turtles under Alternative 2 would be the same as those described for the No Action Alternative. The 17 percent increase in the number of vessels associated with this

alternative would not measurably change effects on sea turtles under Alternative 2 in comparison to the No Action Alternative.

In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, vessel disturbance under Alternative 2 may affect leatherback turtles.

Aircraft Overflights

Under Alternative 2, fixed-wing aircraft overflights associated with 600 sorties would occur above the TMAA annually. This would be a 100 percent increase over the number of overflights in the No Action Alternative. In addition there would be 120 training events that may involve helicopter flights conducted over water at various altitudes, an approximate 275 percent increase in these events from the No Action Alternative. As with the other alternatives, most aircraft overflights would occur over the TMAA at elevations in excess of 15,000 ft (915 m). All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m).

The increase in potential exposure to visual and noise disturbance that would be associated with the increase in sorties and helicopter flights would not measurably increase effects to sea turtles. Sea turtles could exhibit no response, or may change their behavior to avoid the disturbance. Any behavioral avoidance reaction would be short-term and would not permanently displace animals or result in physical harm. Overflights are not expected to result in chronic stress because it is extremely unlikely that individual animals would be exposed to low-altitude overflights during the short periods of takeoff and landing.

In accordance with EO 12114, harm to leatherback turtles from vessel movements in nonterritorial seas would be possible but unlikely. In accordance with the ESA, aircraft overflights under Alternative 2 may affect leatherback turtles.

At-Sea Explosions

Under Alternative 2, approximately 144 live bombs may be dropped during BOMBEX and 84 5-in rounds and 28 76mm rounds could be fired during S-S GUNEX. In addition, 80 SSQ-110A explosive sonobuoys would be used during ASW Tracking Exercises (TRACKEXs) under Alternative 2. These events involving the use of at-sea explosions may occur in all areas of the TMAA. As mentioned previously, monitoring and resource protection undertaken prior to any detonation of an IEER would reduce the likelihood of sea turtles being exposed to such detonations. Protective measures that are used during training activities to identify sea turtle presence and suspend detonation activities if a sea turtle should be spotted would further minimize the potential for harm.

In addition to the events noted above, under Alternative 2 the potential to conduct a SINKEX training event during each of the two possible summer exercise periods is also proposed. During a SINKEX, a decommissioned vessel is towed to a deep-water location and sunk using a variety of ordnance containing high explosives that may include missiles, bombs, and gunfire. For each SINKEX, there may be up to 10 non-inert bombs and 400 explosive rounds of 5-inch gunfire used during the event. For modeling purposes it was assumed that approximately one third of the munitions used (one Maverick missile, three bombs, and 120 of the 5-inch rounds) would miss the target and explode in the water (for details, see Appendix D). SINKEX may also include the use of one MK-48 ADCAP torpedo, which can be used at the end of SINKEX if the target is still afloat.

Aspects of the SINKEX event that have potential effects on sea turtles (e.g., vessel movement, aircraft overflights, gunfire firing noise, munitions constituents) have been analyzed separately in previous

sections. If a sea turtle remained in the immediate vicinity of the SINKEX and ordnance missed the target vessel, injury or mortality could occur. SINKEX under Alternative 2 is, however, not likely to result in impacts to leatherback turtles based on the low number of leatherback turtles likely to be in the TMAA, the assumption that they will not remain in the vicinity of the activities surrounding a SINKEX event, and area clearance procedures (See Section 5.1.7).

An analysis of potential impacts from at-sea explosions under Alternative 2 using acoustic modeling, could not conducted for leatherback turtles. There is no data available regarding the abundance or distribution in the Pacific (NMFS and USFWS 1998c) and no known density or information available to derive an estimate for the number of leatherback turtles in the GOA or in the TMAA. In analyses undertaken for similar actions at other locations, modeling to predict potential impacts required that the zone of influence resulting from each explosion or detonation be multiplied by the sea turtle density to assess the potential for and number of impacts likely (see Sea Turtle Hearing Section and Section 3.7.2.2 for sea turtle-specific thresholds and Section 3.8, Marine Mammals, for a full description of the modeling and methods).

Given the low numbers of leatherback turtles likely present in the TMAA, modeling would likely result in a conclusion that there were no exposures in any event. However, without density information and modeling of potential impacts, there remains a possibility there could be an exposure of a leatherback to at-sea explosions. Based on this assumption, under Alternative 2, the explosions and detonations that would take place in the study area are unlikely to affect leatherback turtles. No sea turtle mortalities would be expected under this alternative. The Navy is working with NMFS through the ESA Section 7 consultation process to address effects to sea turtles for the Preferred Alternative (Alternative 2). NMFS will determine, through issuance of a Biological Opinion, the effect to listed species that may result from implementation of the Proposed Action.

In accordance with EO 12114, harm to leatherback turtles from explosive ordnance use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of explosive ordnance in the TMAA under Alternative 2 may affect leatherback turtles.

Expended Materials

Ordnance-Related Materials

Approximately 39,036 items of ordnance or related materials would be used in the TMAA under Alternative 2; the majority of these are non-explosive rounds, this is a 60 percent increase over current conditions. As discussed for the No Action Alternative and Alternative 1, leatherback turtles would not be expected to be at risk under Alternative 2 from ingesting ordnance-related materials because they feed in the water column, not in the benthic environment. Because these materials sink rapidly and are encrusted on the seafloor, the potential to affect the leatherback would be discountable. In accordance with EO 12114, harm to leatherback turtles from expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, ordnance-related materials under Alternative 2 may affect leatherback turtles.

Nonexplosive Ordnance Use

Approximately 25,922 nonexplosive ordnance rounds would be used in the TMAA under Alternative 2, an increase of 60 percent over the No Action Alternative. Ordnance could be used in all areas of the TMAA. Given the few number of leatherback turtles likely in the TMAA, the large area encompassed by the training activities, and area clearance procedures, the potential for leatherback turtles to be struck by ordnance is low.

In accordance with EO 12114, harm to leatherback turtles from nonexplosive ordnance use in nonterritorial seas would be possible but very unlikely. In accordance with the ESA, nonexplosive ordnance strikes under Alternative 2 may affect leatherback turtles.

Target-Related Materials

At-sea targets used in the TMAA could range from high-technology, remotely operated airborne and surface targets (such as airborne drones) to low-technology, floating, at-sea targets (such as inflatable targets) and airborne, towed banners. A total of 644 targets and target related materials would be used under Alternative 2, an increase of 160% over the No Action Alternative. Many of the targets are designed to be recovered for reuse and are not destroyed during training. The expendable targets used in the study area under this alternative are the Tactical Air Launched Decoy (TALD), BQM-74E, and Killer Tomato. When not recovered after use, these units are large and remain in large pieces when they sink to the bottom after use. Because of this characteristic, they present no ingestion hazard to sea turtles.

As discussed for the No Action Alternative, the smoke and flames produced by marine markers and flares dissipate in the air, having little effect on the marine environment. The light generated from the marker either reflects off the water's surface or enters the water and attenuates in brightness over depth.

In accordance with EO 12114, harm to leatherback turtles from target use in nonterritorial seas would be possible but unlikely. In accordance with the ESA, use of target-related materials under Alternative 2 may affect leatherback turtles.

Chaff

As detailed in Section 3.2.1.1 chaff consists of aluminum-coated polymer fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor. An extensive review of literature, combined with controlled experiments, revealed that chaff use poses little risk to the environment or animals (U.S. Air Force 1997, Naval Research Laboratory 1999, Arfsten et al. 2002, Farrell and Siciliano 2007). The materials in chaff are generally nontoxic except in quantities significantly larger than those any animal could reasonably be exposed to from normal usage. Particulate tests concluded that the concern about chaff fibers breaking down into respirable particle sizes is not a significant issue. Experiments have shown that animals should not suffer toxic or physical effects from chaff ingestion (U.S. Air Force 1997, Naval Research Laboratory 1999). It is likely that due to the small size of chaff, if ingested, it would pass through the digestive tract and be voided naturally without causing harm, sublethal, or lethal effects. Under Alternative 2, although the use of chaff may double as compared to the No Action Alternative, ingestion of chaff remains, although very unlikely, could occur but any effects are likely insignificant and discountable. In accordance with EO 12114, harm to leatherback turtles from use of chaff in nonterritorial seas would be unlikely. In accordance with the ESA, use of chaff under Alternative 2 may affect leatherback turtles.

Portable Undersea Tracking Range

Under Alternative 2, impacts from the PUTR would be the same as those described for Alternative 1. The use of the PUTR is not likely to have impact on sea turtles.

Entanglement

Under Alternative 2, the use of 1,847 expendable devices using parachutes is proposed. Changes in the use of targets, sonobuoys, and markers that are delivered using parachutes were provided under "Target-Related Materials." The greatest risk of entanglement occurs when expendable devices, primarily parachutes, are on or near the surface. Aircraft-launched sonobuoys, flares, and other expendable devices deploy nylon parachutes of varying sizes. At water impact, the parachute lines and assembly is expended

and sinks because all of the material is negatively buoyant. Other components of the expendable devices are metallic and will sink rapidly. Entanglement and the eventual drowning of a leatherback turtle in a parachute assembly would be unlikely because such an event would require the parachute to land directly on a leatherback turtle, or the leatherback turtle to swim into the parachute before it sinks.

In accordance with EO 12114, harm to leatherback turtles from entanglement from military expended materials in nonterritorial seas would be possible but unlikely. In accordance with the ESA, entanglement from military expended materials under Alternative 2 may affect leatherback turtles.

3.7.3 Mitigation

Impacts to the leatherback turtle resulting from the alternatives proposed in this EIS/OEIS would be below thresholds that could adversely affect the continued presence of this species in the GOA or the TMAA. Furthermore, the Navy is working with NMFS through the ESA Section 7 consultation process to ensure that unavoidable significant effects to sea turtles do not result from implementation of the Proposed Action. The current requirements and practices described in Chapter 5 would continue to be implemented, and no further mitigation measures would be needed to protect leatherback turtles in the TMAA.

3.7.4 Summary of Effects

The presence of sea turtle species other than the leatherback turtle is restricted by cold water temperatures that would otherwise result in thermal shock to those species. There is no data available from which to derive the abundance, distribution, or density of leatherback turtles in the TMAA. The presumed low numbers of leatherback turtles based on temperature preference, limited number of stressors from Navy activities, and routine implementation by the Navy of protective measures combine to produce a low potential for effects to leatherback turtles under all the alternatives. Table 3.7-2 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on leatherback turtles under both NEPA and EO 12114.

Table 3.7-2: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles.	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials. • Potential for exposure to at-sea explosions but occurrence is very unlikely. • No long-term effects would occur. • No Action Alternative may affect ESA-listed leatherback turtles.

Table 3.7-2: Summary of Effects by Alternative (Continued)

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 1	• Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles.	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials. • Potential for exposure to at-sea explosions but occurrence is very unlikely. • Because sonars used in the TMAA are above the known hearing range of sea turtles potential for exposure to mid-frequency and high-frequency sources is unlikely. • No long-term effects would occur. • Alternative 1 may affect ESA-listed leatherback turtles.
Alternative 2 (Preferred Alternative)	• Aircraft overflights would occur at altitudes at or above 15,000 ft (915 m) and have no effect on leatherback turtles.	• Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. • Potential for short-term behavioral responses to low level overflights. • Extremely low probability of direct strikes from ordnance and low potential for ingestion of expended materials. • Potential for exposure to at-sea explosions but occurrence is very unlikely. • Because sonars used in the TMAA are above the known hearing range of sea turtles potential for exposure to mid-frequency and high-frequency sources is unlikely. • No long-term effects would occur. • Alternative 2 may affect ESA-listed leatherback turtles.

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3.8 Marine Mammals

3.8 MARINE MAMMALS

3.8.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for marine mammals is the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). The TMAA is more than 12 nautical miles (nm) (22 kilometers [km]) from the closest point of land and is therefore outside of United States (U.S.) territorial Seas. Thus, this section provides an overview of the species, distribution, and occurrence of marine mammals that are either resident, are seasonally present, or migratory through the GOA TMAA. This section also presents the information concerning the affected environment of the GOA TMAA as it relates to marine mammals, provides an analysis of the environmental consequences resulting from the Proposed Action, and summarizes mitigation measures as they relate to protections of marine mammals potentially affected by the Proposed Action. The mitigation measures relating to the protection of marine mammals are presented in detail in Section 5.1.7 of Chapter 5, Mitigation Measures, of this EIS/OEIS.

All marine mammals are protected under the Marine Mammal Protection Act (MMPA). In addition, specific "listed species" are protected under the Endangered Species Act (ESA). Both the MMPA and ESA are administered by the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS).

Information on species listed under the ESA is presented first, followed by non-ESA listed marine mammals subject to regulation under the Marine Mammal Protection Act (MMPA). These lists are further subdivided by taxonomic Order with the species listed by common name in alphabetical order. Tables are provided to summarize this information where appropriate.

Seven of the marine mammals found in the TMAA are designated "listed species" under the ESA. The ESA has additional requirements when assessing the effect of proposed activities on those species and their critical habitats. Sections 3.8.7.1 and 3.8.7.2 provide further details. All marine mammals are protected under the Marine Mammal Protection Act (MMPA) of 1972, amended in 1994. The MMPA is administered by the NMFS and the USFWS.

Marine mammals that are expected to be present within the TMAA belong to two taxonomic groups:

- *Cetaceans* is the generalized term describing both *mysticetes* (large whales with baleen) and *odontocetes* (toothed whales, porpoises, and dolphins).
- *Pinnipeds* (seals and sea lions) are divided into eared seals or *otariids* such as Steller sea lions and Northern fur seals, and earless seals or *phocids* such as harbor seals and elephant seals. Although pinnipeds come ashore to rest, molt, breed, and bear young, the waters of the TMAA are locations where they may hunt and feed.

There are 26 species of marine mammals with possible or confirmed occurrence in the waters of the GOA (Carretta et al. 2007, Angliss and Allen 2009, Rone et al. 2009, Stafford 2009), but not all inhabit waters within the TMAA (Table 3.8-1). Six species, the beluga whale (*Delphinapterus leucas*), false killer whale (*Pseudorca crassidens*), northern right whale dolphin (*Lissodelphis borealis*), Risso's dolphin (*Grampus griseus*), short-finned pilot whale (*Globicephala macrorhynchus*), and sea otter (*Enhydra lutris*), are considered extralimital in the TMAA and not expected to be present given their documented habitat preferences (Department of the Navy [DoN] 2006, Angliss and Outlaw 2007). Since the TMAA is well outside the normal range of these species, they will be discussed briefly and then dismissed from further analysis.

Table 3.8-1: Summary of Marine Mammal Species Found in the GOA

Common Name *Species Name*	Abundance[a] (CV)	Stock	Calculated Density in the TMAA[b] (animals per km^2)	Population Trend	Occurrence in the TMAA (Apr - Dec)	Designated Critical Habitat
ESA Listed Cetaceans						
Blue whale[1,3,4] *Balaenoptera musculus*	1,368 (0.22)	Eastern North Pacific	No Density	May be increasing	Rare	None in North Pacific
Cook Inlet Beluga Whale[1,3,4] *Delphinapterus leucas*	375[c]	Cook Inlet	NA	Decreasing	Extralimital	None
Fin whale [1,3,4] *Balaenoptera physalus*	2,636 (0.15)	Northeast Pacific	0.010	Increasing 4.8 percent annually	Common	None
Humpback whale[1,3,4] *Megaptera novaeangliae*	4,005 (0.95)	Central North Pacific and Western North Pacific	0.0019	May be increasing	Common	None
North Pacific Right Whale[1,3,4] *Eubalaena japonica*	Unknown[6] (may be < 100 whales)	Eastern North Pacific	No Density	Unknown (may be decreasing)	Very rare	Yes - Outside of the TMAA
Sei whale[1,3,4] *Balaenoptera borealis*	43 (0.61)	Eastern North Pacific	No Density	May be increasing	Very rare	None
Sperm whale[1,3,4] *Physeter macrocephalus*	Unknown	North Pacific	0.0003	Unknown	Rare	None
ESA Listed Pinnipeds						
Steller sea lion [2,3,4] *Eumetopias jubatus*	45,095-55,832	Eastern Distinct Population Segments (DPS).	0.0098	Increasing (3.1 percent/year)	Common	Yes- Outside of the TMAA
Steller sea lion [1,3,4] *Eumetopias jubatus*	38,988	Western DPS	0.0098	Decreasing (5.4 percent/year)	Common	Yes- Outside of the TMAA
ESA listed Mustelid						
Sea otter *Enhydra lutris*	Unknown	South Central, Southeast and South West Alaska[2,3]	NA	Increasing	Extralimital	None
Non-ESA Listed Cetaceans						
Baird's beaked whale *Berardius bairdii*	Unknown	Alaska	0.0005	Unknown	Rare	None
Cuvier's beaked whale *Ziphius cavirostris*	Unknown	Alaska	0.0022	Unknown	Common	None

Table 3.8-1: Summary of Marine Mammal Species Found in the GOA (continued)

Common Name *Species Name*	Abundance[a] (CV)	Stock	Calculated Density in the TMAA[b] (animals per km^2)	Population Trend	Occurrence in the TMAA (Apr - Dec)	Designated Critical Habitat
Non-ESA Listed Cetaceans (continued)						
Dall's porpoise *Phocoenoides dalli*	83,400 (0.097)	Alaska	0.1892	Unknown	Common	None
False killer whale *Pseudorca crassidens*	Unknown	Hawaii	NA	Unknown	Extralimital	None
Gray whale *Eschrichtius robustus*	18,813 (0.069)	Eastern North Pacific	0.0125	Increasing	Common	None
Harbor porpoise[3] *Phocoena phocoena*	41,854 (0.224)	Gulf of Alaska	No Density	Stable	Rare	None
Killer whale- *Orcinus orca* (Multiple stocks that may occur in the TMAA)	249-1,123	Eastern North Pacific Alaska Resident & Northern Resident, Gulf of Alaska, Aleutian Islands and Bering Sea, AT1[3,4], West Coast and Offshore	0.010 (for all killer whales)	Increasing	Common	None
Minke whale *Balaenoptera acutorostrata*	Unknown	Alaska	0.0006	Unknown	Rare	None
Northern right whale dolphin *Lissodelphis borealis*	12,876 (0.30)	California/ Oregon/ Washington	NA	No trend	Extralimital	None
Pacific white-sided dolphin *Lagenorhynchus obliguidens*	26,880 (0.90)	North Pacific	0.0208	Unknown	Common	None
Risso's Dolphin *Grampus griseus*	11,621 (0.17)	California, Oregon, and Washington	NA	Unknown	Extralimital	None
Short-finned pilot whale *Globicephala macrorhynchus*	245 (0.97)	California, Oregon, and Washington	NA	Unknown	Extralimital	None
Stejneger's beaked whale *Mesoplodon stejnegeri*	Unknown	Alaska	Density of Cuvier's beaked whale used as a surrogate[d]	Unknown	Common	None

Table 3.8-1: Summary of Marine Mammal Species Found in the GOA (continued)

Common Name *Species Name*	Abundance[a] (CV)	Stock	Calculated Density in the TMAA[b] (animals per km^2)	Population Trend	Occurrence in the TMAA (Apr - Dec)	Designated Critical Habitat
Non-ESA Listed Pinnipeds						
California sea lion *Zalophus californianus*	238,000	U.S.	No Density	Increasing	Very rare	None
Harbor seal *Phoca vitulina richardii*	45,975 (0.04)	Gulf of Alaska	NA	Stable	Very rare	None
Northern elephant seal *Mirounga angustirostris*	124,000	California Breeding	0.0022	Increasing	Common	None
Northern fur seal[3,4] *Callorhinus ursinus*	665,550	Eastern Pacific	0.1180	Decreasing[5]	Common	None
Ribbon seal Histriophoca fasciata	58,000[7]	Alaska	NA	NA	Rare	None

Sources: Barlow and Forney 2007, Angliss and Allen 2009, Carretta et al. 2007, DoN 2007, Dahlheim et al. 2009

Notes: ESA notations: [1]endangered; [2]threatened. MMPA designations: [3]strategic stock; [4]depleted.

[5]The assessment of the population trend in fur seals was performed by obtaining counts of adult males and estimates of the numbers of pups born. Although the most recently obtained numbers of adult male fur seals in the Pribilof Islands shows an increase, since 1998, pup production at the primary Pribilof Island breeding colonies has declined at an annual rate of 5.2% (Alaska Fisheries Science Center 2008).

[6] Wade et al. (2010) estimated abundance for North Pacific right whales in the Bering Sea and Aleutian Islands at 28 to 31 individuals based on genotypic and photographic data, respectively; this includes 8 females and 20 males. These estimates may relate to a Bering Sea subpopulation, although other data suggest that the total eastern North Pacific population is unlikely to be much larger.

[7] Numbers are for ribbon seals present in the central Bering Sea; Peter Boveng, National Marine Mammal Laboratory, personal communication, 12 Aug 2010. A reliable abundance estimate for the Alaska stock of ribbon seals is currently not available (Angliss and Allen 2009).

[a] Abundance numbers reported are for the entire stock (as listed in the next column) and not representative of the abundance present in the TMAA or GOA.

[b] Densities calculated for summer as discussed in Appendix E

[c] NOAA 2008a; Endangered Status for the Cook Inlet Beluga Whale

[d] No current estimates of abundance for Stejneger's beaked whales are available. Given that sufficient information exists for Cuvier's beaked whale, they are in the same taxonomic family, and the predicted density of Cuvier's beaked whale in the GOA is higher than that of Baird's beaked whales, estimates therefore err on the side of overestimation.

CV = Coefficient of Variation

km^2 = square kilometer

TMAA = temporary Maritime Activities Area

NA = not applicable given species is extralimital to TMAA.

The abundance for each species is specific to that species and varies seasonally in Alaska waters (Table 3.8-1; in simple terms, abundance is the number in a specified area and the density is the number per unit area). For purposes of analysis of environmental effects in this section, the abundance of the marine mammal species has been estimated using the summer months, which is when they are most abundant and when the proposed action would occur. As reflected in Table 3.8-1, many species are listed as common, indicating that they occur routinely, either year-round or during annual migrations into or through the area.

Blue, North Pacific right, and sei whales are considered rare, are too few in number to allow for quantitative analysis, and are included here only for discussion purposes given they are endangered species. Some species are indicated as "rare" because of sporadic sightings and species listed as "very rare" are very few in number globally, very few in number in the TMAA, or are unlikely to be present in the TMAA. Those species considered "extralimital" are considered outside their normal habitat range in the TMAA although their past presence may have been documented on a few occasions in GOA. Odontocetes occurring regularly include sperm whale, Cuvier's, Baird's, and Stejneger's beaked whales, killer whale, Pacific white-sided dolphin, and Dall's porpoise (Angliss and Allen 2009, Rone et al. 2009). All of the species that occur in the TMAA are either cosmopolitan (occur worldwide), or associated with the temperate and sub-Arctic oceans (Leatherwood et al. 1988). For many species, the TMAA constitutes a small portion of their total range given seasonal migrations to warmer waters where breeding and calving occur. These species, for example, include the humpback whale (*Megaptera noveangliae*) and gray whale (*Eschrichtius robustus*), which both feed in Alaska waters in roughly the May to September timeframe.

The 20 species that occur in the TMAA include 7 species of baleen whales (mysticetes), 8 species of toothed whales/dolphins/porpoises (odontocetes), and 5 species of seals and sea lions (pinnipeds). Tables 3.8-1 and 3.8-2 summarize the available information regarding their density, ESA and MMPA status, population trends, and occurrence in the area.

Table 3.8-2: Summary of Marine Mammal Species, Density, and Information Sources for the TMAA in Summer (April – October)

Species	Density (animal /km^2)	Source
ESA Listed Species		
Fin whale	0.010	Rone et al. (2009)
Humpback whale	0.0019	Rone et al. (2009)
Sperm whale	0.0003	Waite (2003), Mellinger et al. (2004)
Steller sea lion	0.0098	Angliss and Allen (2008), Bonnell and Bowlby (1992)
Non-ESA Listed Species		
Gray whale	0.0125	Moore et al. (2007)
Minke whale	0.0006	Waite (2003)
Baird's beaked whale	0.0005	Waite (2003)
Cuvier's beaked whale	0.0022	Waite (2003)
Dall's porpoise	0.1892	Waite (2003)
Killer whale	0.0100	Zerbini et al. (2007)
Pacific white-sided dolphin	0.0208	Waite (2003)
Northern elephant seal	0.0022	Carretta et al., 2009
Northern fur seal	0.1180	Carretta et al., 2009

Notes: ESA = Endangered Species Act, km^2 = squared kilometers

Information presented in Tables 3.8-1 and 3.8-2 was compiled mainly from NMFS Stock Assessment Reports (Angliss and Outlaw 2007, Angliss and Allen 2009, Carretta et al. 2008) and supporting literature as referenced. Life history and habitat information for these species in the GOA was previously detailed in the Marine Resources Assessment for the GOA Operating Area (DoN 2006). Much of the species-specific information in that comprehensive assessment has been brought forward into this section of the EIS/OEIS in summary or verbatim for the convenience of the reader.

Much of the analysis in this section deals with potential consequences resulting from exposure to underwater sound associated with Navy training activities. Behavioral responses to sound are greatly influenced by the context of the exposure and the individual animal's experience, motivation, and conditioning (Southall et al. 2007). While this leads to great variance in potential responses to a given sound, measurements of marine mammal sound production and hearing capabilities provide some basis for assessment of whether exposure to a particular sound source (its frequency and sound level) may affect a marine mammal behaviorally or potentially result in direct injury. Table 3.8-3 provides a summary of sound production and hearing capabilities for marine mammal species in the TMAA.

Table 3.8-3: Sound Production and Hearing Capabilities of Marine Mammals in the TMAA

Common Name	Sound Production		Hearing Ability
	Frequency Range (kHz)	Source Level Sound (dB re 1 µPa @ 1 m)	Frequency Range (kHz)
Baleen whales			
Blue whale	0.012 - 0.4	188 (maximum)	Not Available
Fin whale	0.010 - 0.75	155 - 186	Not Available
Gray whale	0.020 - 20	142 - 185	<2
Humpback whale	0.020 - 10	144 - 192	0.7 - 10 (predicted)
Minke whale	0.060 - 20	150 - 175	Not Available
North Pacific right whale	0.050 - 0.6	137 - 192	0.010 - 22 (predicted)
Sei whale	0.433 (+/- 0.192) - 3.5	156 +/- 3.6	Not Available
Toothed whales			
Baird's beaked whale	4 - 42	Not Available	Not Available
Cuvier's beaked whale	0.3 - 135	214 (maximum)	Not Available
Dall's porpoise	0.04 - 160	120 - 175	Not Available
Harbor porpoise	0.04 - 160	135 - 177	16 - 140
Killer whale	0.1 - 35	137 - 224	<0.5 - 105
Pacific white-sided dolphin	0.002 - 80	170 (peak amplitude)	0.075 - 150
Stejneger's beaked whale	Not Available	Not Available	Not Available
Sperm whale	0.1 - 30	140 - 236	5 - 20 (measured from 1 neonatal sperm whale)
Pinnipeds			
Harbor seal	0.1 - 150	Not Available	1 - 180
Northern elephant seal	0.2 - 1	Not Available	0.075 - 45
Northern fur seal	Not Available	Not Available	0.5 - 60
Steller sea lion	0.03 - 3 (female calls only)	Not Available	1 - 25
California sea lion	0.25 - 6	Not Available	1 - 40

Notes: Information presented in this table was compiled from numerous literature and technical sources, which are identified in each species profile.dB re 1 µPa @ 1 m = decibels referenced to 1 micropascal at 1 meter, kHz = kilohertz, TMAA = Temporary Maritime Activities Area

3.8.1.1 Marine Mammal Species Excluded from Further Analysis

Cook Inlet Beluga Whales

Only 28 sightings of beluga in the GOA have been reported from 1936 to 2000 (Laidre et al. 2000). The nearest beluga whales to the TMAA are in Cook Inlet with an abundance estimate of 375 whales in the Cook Inlet stock as of 2008 (NOAA 2008a). Cook Inlet beluga whales were listed as endangered on 22 October 2008 and have been previously designated as depleted under the MMPA (NOAA 2008a). Cook Inlet beluga whales do not leave the waters of Cook Inlet (NOAA 2007, 2008a). Cook Inlet is approximately 70 nm (129.6 km) from the nearest edge of the TMAA. Based on this information, and the regulatory definition of the stock as those beluga whales confined to the waters of Cook Inlet, this stock of beluga whales will not be present in the TMAA, so this species will not be considered in greater detail in the remainder of this analysis.

False Killer Whale

False killer whales should not occur in the TMAA. False killer whales are found in tropical and temperate waters, generally between 50°S and 50°N latitude (Baird et al. 1989, Odell and McClune 1999). The southernmost point boundary of the TMAA is well north of 55°N latitude. There have been records of false killer whale sightings as far north as the Aleutian Islands and Prince William Sound in the past (Leatherwood et al. 1988). A solitary false killer whale was sighted in May 2003 near Juneau, but this was considered to be far north of its normal range (DoN 2006). There are no abundance estimates available for this species in the NMFS stock assessment report for this area of the Pacific. In summary, false killer whales are considered extralimital to the TMAA and will not be considered further in this analysis.

Northern Right Whale Dolphin

Northern right whale dolphins (*Lissodelphis borealis*) should not occur in the TMAA. This species occurs in North Pacific oceanic waters and along the outer continental shelf and slope in cool temperate waters colder than 20°C. This species is distributed approximately from 30°N to 55°N and 145°W to 118°E (both south and east of the TMAA). There are two records of northern right whale dolphins in the GOA (one just south of Kodiak Island), but these are considered extremely rare (DoN 2006). There are no abundance estimates available for this species in the NMFS stock assessment report for this area of the Pacific. In summary, northern right whale dolphins are considered extralimital to the TMAA and will not be considered further in this analysis.

Ribbon Seal

Ribbon seals primarily inhabit areas of the Arctic Ocean, Bering Sea, Chukchi, and western Beaufort Sea (Angliss and Allen 2009). Ribbon seals disperse widely from their winter sea ice habitat and are solitary during the summer while they forage at sea. In 2007, one adult female ribbon seal was observed and captured on shore in upper Cook Inlet and in autumn 2009 another was observed on the Copper River Delta (Boveng 2010). Tagging studies in 2009 (unpublished) showed one of 14 tagged seals spent time in the western GOA and the TMAA or in vicinity of the TMAA (Cameron 2010). Given the small sample size represented by the tagging and these two other observations, use of the Gulf of Alaska by a small fraction of the ribbon seal population may be common (Boveng 2010). Ribbon seal were not detected in the recent Gulf of Alaska Line-Transect Survey (GOALS), but they are hard to detect at sea so their non-detection during previous surveys is not indicative of absence from the area.

Recent preliminary data indicate it is possible that ribbon seal may be present in the TMAA. Given however, that the number of ribbon seals would likely be limited to a few individuals and because the proposed events will take place spread over the TMAA area of 42,146 square nautical miles (145,482

square kilometers), it is unlikely that ribbon seal will be encountered. For this reason, potential effects to ribbon seal will not be considered further in this analysis.

Risso's Dolphin

The Risso's dolphin is distributed worldwide in tropical to warm-temperate waters, roughly between 60°N and 60°S, where surface water temperature is usually greater than 50°F (10°C) (Kruse et al. 1999). The average sea surface temperature for the GOA is reported to be approximately 49.3°F (9.6°C) and has undergone a warming trend since 1957 (Aquarone and Adams 2008). The average summer temperature within the upper 328 ft (100 m) of the TMAA is approximately 52°F (11°C) based on data as presented in the modeling analysis. In the eastern Pacific, Risso's dolphins range from the GOA to Chile (Leatherwood et al. 1980, Reimchen 1980, Braham 1983, Olavarria et al. 2001). Water temperature appears to be a factor that affects the distribution of Risso's dolphins in the Pacific (Leatherwood et al. 1980, Kruse et al. 1999). Risso's dolphins are expected to be extralimital in the TMAA. They prefer tropical to warm-temperate waters and have been seldom sighted in the cold waters of the GOA. There are a few records of this species near the TMAA. Risso's dolphins have been sighted near Chirikof Island (southwest of Kodiak Island) and offshore in the GOA, just south of the TMAA boundary (Consiglieri et al. 1980, Braham 1983). Based on the above information, there is a very low likelihood of Risso's dolphins being present in the action area, so this species will not be considered in greater detail in the remainder of this analysis.

Short-finned Pilot Whale

Short-finned pilot whales should not occur in the TMAA. This species is found in tropical to warm-temperate seas, generally in deep offshore areas and they do not usually range north of 50°N (DoN 2006). There are two records of this species in Alaskan waters. A short-finned pilot whale was taken near Katanak on the Alaska Peninsula in 1937 and a group of five short-finned pilot whales were sighted just southeast of Kodiak Island in May 1977 (DoN 2006). There are no abundance estimates available for this species in the NMFS stock assessment report for this area of the Pacific. In summary, short-finned pilot whales are considered extralimital to the TMAA and will not be considered further in this analysis.

Sea Otter

On 16 December 2008, the USFWS proposed to designate critical habitat for the Southwest Alaska stock of the northern sea otter (*Enhydra lutris kenyoni*) under the ESA (Department of the Interior [DOI] 2008). This critical habitat designation was effective as of 9 November 2009. This species is under the federal jurisdiction of the USFWS.

Sea otters are primarily found within 1-2 km (0.5-1.1 nm) of the shore and/or the 30 fathom (55 m) isobath (DOI 2008, NMFS 2005). Critical habitat map unit boundaries for "Unit 5" in the Kodiak Island area are for nearshore waters within approximately 328 ft (100 m) from the mean high tide line. The closest point from the critical habitat to the TMAA is located more than 24 nm (44 km) from the western corner of the TMAA. Sea otters are considered extralimital to the TMAA and none were encountered within the TMAA during the April 2009 GOALS survey (Rone et al. 2009).

Sea otters dive to gather food from the ocean floor in relatively shallow water in areas with both rocky substrate and soft bottom sediments. Sea otter feeding habits are directly correlated with water depth. Best available science suggests that female sea otters typically dive in 20 m (65.6 ft) or less to forage while male sea otters dive in 40 m (131.2 ft) or less. Data suggests that it is possible for sea otters to dive down to 80 m (262.4 ft) of water and in more extreme instances up to 100 m (328 ft). It is not known if sea otters can dive deeper than 100 m (328 ft). As shown in Figure 3.5-1, the bathometry of the TMAA typically ranges from 100 m (328 ft) to over 3,000 m (9,842.5 ft) in depth. While sea otters are not typically found in areas where the water depth is over 100 m (328 ft), they may occur in deeper waters

due to drifting or competition for foraging areas (Burn 2010). However, with the exception of the area east of Kodiak Island, sea otters are not expected to regularly be present in the TMAA. Therefore, sea otters are not likely to occur within the TMAA area because of two factors: foraging diving depth limitations (ranging from 2 to 75 m [6.5 to 246 ft]) and the bathymetry of the TMAA (typically deeper than 100 m [328 ft]).

3.8.2 Estimated Marine Mammal Densities and Distribution

Baleen and toothed whales as well as dolphins and porpoises, collectively known as cetaceans, spend their entire lives in the water and spend most of the time (>90 percent for most species) entirely submerged below the surface. When at the surface, cetacean bodies are almost entirely below the water's surface, with only the blowhole exposed to allow breathing. This makes cetaceans difficult to locate visually and also exposes them to underwater noise, both natural and anthropogenic, essentially 100 percent of the time because their ears are nearly always below the water's surface. Seals and sea lions (pinnipeds) spend significant amounts of time out of the water during breeding, molting and hauling out periods. In the water, pinnipeds spend varying amounts of time underwater, as some species regularly undertake long, deep dives (e.g., elephant seals) and others are known to rest at the surface in large groups for long amounts of time (e.g., California sea lions). Sea lions often forage in bouts and then rest at the surface therefore their overall time underwater is much less than a cetacean. When not actively diving, pinnipeds at the surface often hold their heads above the water surface. Consequently, pinnipeds may not be exposed to underwater sounds to the same extent as cetaceans.

For the purposes of this analysis, the Navy has adopted a conservative approach to modeling underwater noise exposure to marine mammals, in that it will tend to overestimate exposures as follows:

- *Cetaceans – assume 100 percent of time is spent underwater and therefore exposed to noise.*
- *Pinnipeds – adjust densities to account for time periods spent at breeding areas, haulouts, etc.; but for those animals in the water, assume 100 percent of time is spent underwater and therefore exposed to noise.*

3.8.2.1 Derivation of Marine Mammal Density Estimates for TMAA

Recent survey data for marine mammals in the GOA was limited and most survey efforts were localized and extremely near shore. In addition to the visual surveys, there is evidence of occurrence of several species based on acoustic studies, but these do not provide measurements of abundance (e.g., Stafford 2009).

In April 2009, the Navy funded and NMFS conducted the Gulf of Alaska Line-Transect Survey (GOALS) to address the data needs for this analysis (Rone et al. 2009). Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. This survey resulted in sightings of several species and allowed for the derivation of densities for fin and humpback whale (Rone et al. 2009). In addition to this latest survey, two previous vessel surveys conducted in the near shore region of the TMAA were also used to derive the majority of the density data used in acoustic modeling for this analysis. The methods used to derive density estimates for all remaining species in the TMAA are detailed in Appendix E and summarized below.

Zerbini et al. (2006) conducted dedicated vessel surveys for large whales in summer 2001-2003 from Resurrection Bay on the Kenai Peninsula to Amchitka Island in the Aleutian Islands. Survey effort near the TMAA was nearshore (within approximately 46 nm [85 km] of shore), and is delineated as "Block 1" in the original paper. Densities for this region were published for fin and humpback whales.

Waite (2003) conducted vessel surveys for cetaceans near Kenai Peninsula, within Prince William Sound and around Kodiak Island, during acoustic-trawl surveys for pollock in summer 2003. Surveys extended offshore to the 1,000 meter (3,280 feet [ft]) isobath and therefore overlapped with some of the TMAA. Waite (2003) did not calculate densities, but did provide some of the elements necessary for calculating density (see Appendix E).

Gray whale density was calculated from data obtained from feeding studies near shore in the GOA. Gray whales are found almost exclusively in near shore areas; therefore, they would not be expected to be found in the majority of the TMAA (>50 nm [93 km] offshore and >5,997 ft [1,828 m] depth). (DoN 2006) The recent 2009 survey encountered one group of two gray whales on the shelf within the western edge of the TMAA and two groups well outside the TMAA near shore at Kodiak Island (Rone et al. 2009).

In Alaskan waters, harbor porpoises inhabit nearshore areas and are common in bays, estuaries, and tidal channels. In the GOA, harbor porpoise inhabit coastal waters where depths are less than 328 ft (100 m) in depth (DoN 2006, Angliss and Allen 2009). The majority of the TMAA is well offshore of the normal habitat range for harbor porpoise. There is no density data available for this species in the nearshore fraction of the TMAA overlapping the harbor porpoise range. An estimated quantification of impacts for harbor porpoise was, however, undertaken as is described in Section 3.8.4.6.

Pinnipeds occurring regularly include Steller sea lion, northern fur seal, and northern elephant seal. California sea lion range extends as far north as the Pribilof Islands in the Bering Sea. Tagging data indicate that most northern fur seal forage and migration takes place to the west of the TMAA (Ream et al. 2005), although the derived density for this species assumed the population would be present in the area for modeling purposes. Harbor seals are primarily a coastal species and are rarely found more than 12 miles (mi) (20 km) from shore (DoN 2006). Harbor seals should be very rare in the TMAA and there was no attempt to model for this species.

Pinniped at-sea density is not often available because pinniped abundance is obtained via shore counts of animals at known rookeries and haulouts. Lacking any other available means of quantification, densities of pinnipeds were derived using shore counts. Several parameters were identified for pinnipeds from the literature, including area of stock occurrence, number of animals (which may vary seasonally) and season, and those parameters were then used to calculate density. Once density per "pinniped season" was determined, those values were prorated to fit the warm water (June-October) and cold water (November-May) seasons. Determining density in this manner is risky as the parameters used usually contain error (e.g., geographic range is not exactly known and needs to be estimated and abundance estimates usually have large variances). As is true of all density estimates, they assume that animals are always distributed evenly within an area which is likely never true. Table 3.8-2 presents all available densities of species for the TMAA and pertinent references.

Additional information on all species can be found in the Marine Resources Assessment for the GOA Operating Area (DoN 2006). The Marine Resource Assessment listed 6 mysticetes, 12 odontocetes, and 5 pinnipeds as occurring or possibly occurring in the GOA region (DoN 2006; Table 3.8-1). However, several of the species listed are extralimital to the TMAA. Only species for which densities are available are included in Table 3.8-2.

3.8.2.2 Depth Distribution

There is limited depth distribution data for most marine mammals. There are a few different methodologies/techniques that can be used to determine depth distribution percentages, but by far the most widely used technique currently is the time-depth recorder. These instruments are attached to the animal for a fairly short period of time (several hours to a few days) via a suction cup or glue, and then

retrieved immediately after detachment or when the animal returns to the beach. Depth information can also be collected via satellite tags, sonic tags, digital tags, and, for sperm whales, via acoustic tracking of sounds produced by the animal itself.

There are somewhat suitable depth distribution data for a few marine mammal species. Sample sizes are usually extremely small, nearly always fewer than 10 animals total and often only 1 or 2 animals. Depth distribution information often must be interpreted from other dive and/or preferred prey characteristics. Depth distributions for species for which no data are available are extrapolated from surrogate species (example in Section 3.8.4.9).

3.8.2.3 Density and Depth Distribution Combined

Marine mammal density is nearly always reported for an area as animals per square kilometer (km^2). Analyses of survey results using Distance Sampling techniques include correction factors for animals at the surface but not seen, as well as animals below the surface and not seen. Therefore, although the area (e.g., km^2) appears to represent only the surface of the water (two-dimensional [2-D]), density actually implicitly includes animals anywhere within the water column under that surface area. Density assumes that animals are uniformly distributed within the prescribed area, even though this is likely rarely true. Marine mammals are usually clumped in areas of greater importance, for example, areas of high productivity, lower predation, safe calving, etc. Density can occasionally be calculated for smaller areas that are used regularly by marine mammals, but more often than not there is insufficient data to calculate density for small areas. Therefore, assuming an even distribution within the prescribed area remains the norm.

The ever-expanding database of marine mammal behavioral and physiological parameters obtained through tagging and other technologies has demonstrated that marine mammals use the water column in various ways, with some species capable of regular deep dives (<2,625 ft [<800 m]) and others regularly diving to <656 ft (<200 m), regardless of the bottom depth. Assuming that all species are evenly distributed from surface to bottom is almost never appropriate and can present a distorted view of marine mammal distribution in any region.

By combining marine mammal density with depth distribution information, a more accurate three-dimensional (3-D) density estimate is possible. These 3-D estimates allow more accurate modeling of potential marine mammal exposures from specific noise sources. See Appendix D for additional modeling information.

3.8.3 ESA Species

3.8.3.1 Blue Whale

Stock

Eastern North Pacific

Regulatory Status

Blue whales (*Balaenoptera musculus*) are listed as endangered under the ESA and a recovery plan has been prepared (NMFS 1998b). The Eastern North Pacific (ENP) stock is designated depleted and classified as strategic under the MMPA.

Habitat Preferences & Critical Habitat

Blue whales inhabit both coastal and oceanic waters in temperate and tropical areas (Yochem and Leatherwood 1985). Important foraging areas include the edges of continental shelves and upwelling regions (Reilly and Thayer 1990, Schoenherr 1991). There is an absence of information available for blue

whales in Alaska waters. Feeding grounds have been identified in coastal upwelling zones off the coast of California (Croll et al. 1998, Fiedler et al. 1998, Burtenshaw et al. 2004) and Baja California, Mexico (Reilly and Thayer 1990). Blue whales off the coast of southern California appear to feed exclusively on dense schools of krill between 328 and 656 ft (100 and 200 m; Croll et al. 1998, Fiedler et al. 1998). These concentrations form downstream from upwelling centers in close proximity to regions of steep topographic relief off the continental shelf break (Croll et al. 1999). Migratory movements of blue whales in California probably reflect seasonal patterns and productivity (Croll et al. 2005). Blue whales also feed in cool, offshore, upwelling-modified waters in the eastern tropical and equatorial Pacific (Reilly and Thayer 1990, Palacios 1999). Moore et al. (2002) determined that blue whale call locations in the western north Pacific were associated with relatively cold, productive waters and fronts. Stafford et al. (2007), however, reports that the distribution of northeastern Pacific blue whales was not correlated to sea surface temperature.

Critical habitat has not been designated for blue whales.

Population Size and Trends

Two stocks are recognized within U.S. North Pacific waters: the Western North Pacific stock (Hawaiian) and the ENP (NMFS 2006c). The ENP stock includes animals found from the northern GOA to the eastern tropical pacific. There is a minimum population estimate of 1,368 (Coefficient of Variation [CV] = 0.22) individuals in the ENP blue whale stock (Carretta et al. 2007) but no estimates for blue whales are available for the Alaska Stock Assessment (Angliss and Allen 2009). There are insufficient numbers of individuals of this species present in the TMAA to allow for acoustic impact modeling given they are rare.

While it is expected that the north Pacific population of blue whales has increased since being given protected status in 1966, there is no clear information on the population structure or population trend of species. The abundance of blue whales along the California coast has clearly been increasing (Calambokidis et al. 1990, Barlow 1994, Calambokidis 1995). However, the scarcity of blue whales in areas of former abundance (e.g., GOA near the Aleutian Islands) suggests that the potential increasing trend does not apply to the species' entire range in the eastern north Pacific (Calambokidis et al. 1990).

Distribution

Blue whales are distributed from the ice edges to the tropics in both hemispheres. In the North Pacific Ocean, blue whales are sighted from Kamchatka (Russia) to southern Japan in the west, and from the GOA south to at least Costa Rica in the east. Historical areas of concentrations include the eastern GOA, the eastern Aleutians, and the far western Aleutians (DoN 2006).

Blue whales as a species are thought to summer in high latitudes and move into the subtropics and tropics during the winter. A discovery tag on a blue whale by whalers off Vancouver Island in May 1963 was recovered a year later in June 1964 just south of Kodiak Island and a blue whale photoidentified south of Prince William Sound was identified five times between 1995 and 1998 off southern California. These occurrences support the hypothesis that blue whales seasonally migrate to and from feeding areas in the GOA (DoN 2006). Data from both the Pacific and Indian Oceans, however, indicate that some individuals may remain year-round in low latitudes, such as over the Costa Rican Dome. The productivity of the Costa Rican Dome may allow blue whales to feed during their winter calving/breeding season and not fast, like humpback whales are believed to do.

In the GOA, three blue whales were sighted in the summer of 2004 during survey work (Calambokidis et al. 2008). Blue whale calls, with a strong seasonal pattern, have been acoustically detected in the GOA in mid-July to mid-December with the peak occurrence from August through November (Moore et al. 2006,

DoN 2006). The area of primary occurrence is seaward of the shelf break, with waters over the shelf area of a secondary occurrence (DoN 2006).

Life History

The eastern North Pacific stock of blue whales feeds in waters from California to Alaska in summer and fall and migrates south to the waters of Mexico to Costa Rica in winter for breeding and to give birth (Mate et al. 1999).

Reproduction/Breeding

Calving occurs primarily during the winter (Yochem and Leatherwood 1985) and blue whales move south from feeding areas to give birth. There are no known areas used by blue whales for reproduction or calving in the TMAA.

Diving Behavior

Blue whales spend more than 94 percent of their time below the water's surface (Lagerquist et al. 2000). Croll et al. (2001) determined that blue whales dived to an average of 462 ft (141 m) and for 7.8 minutes (min) when foraging and to 222 ft (68 m) and for 4.9 min when not foraging. Calambokidis et al. (2003) deployed tags on blue whales and collected data on dives as deep as about 984 ft (300 m).

Acoustics

In 1994 off the coast of California, blue whale vocalizations at 17 hertz (Hz) were estimated to have source levels in the range of 195 decibels (dB) referenced to 1 micropascals at a distance of 1 meter (dB re 1 µPa @ 1 m) (Aburto et al. 1997). Blue whale vocalizations are long, patterned low-frequency sounds with durations up to 36 seconds repeated every 1 to 2 min. Their frequency range is 12 to 400 Hz, with dominant energy in the infrasonic range at 12 to 25 Hz (see Table 3.8-3) (Ketten 1998, Mellinger and Clark 2003). Vocalizations of blue whales in Alaska appear be of two distinct types suggestive of separate populations consisting of western Pacific and northeastern Pacific types (Moore et al. 2006). While no data on hearing ability for this species are available, it is hypothesized that mysticetes have excellent low frequency hearing (Ketten 1997).

Impacts of Human Activity

Historic Whaling

Blue whales were occasionally hunted by the sailing-vessel whalers of the 19th century (Carretta et al. 2008). The introduction of steam power in the second half of that century made it possible for boats to overtake large, fast-swimming blue whales and other rorquals. From the turn of the century until the mid-1960s, blue whales from various stocks were intensely hunted in all the world's oceans (NMFS 1998b). Blue whales were protected in portions of the Southern Hemisphere beginning in 1939, but were not fully protected in the Antarctic until 1965. In 1966, they were given complete protection in the North Pacific under the International Convention for the Regulation of Whaling (Gambell 1979, Best 1993). Some illegal whaling by the Union of Soviet Socialist Republics have occurred in the north Pacific (Yablokov 1994); it is likely that blue whales were among the species taken by these operations, but the extent of the catches is not known. Since gaining complete legal protection from commercial whaling in 1966, some populations have shown signs of recovery, while others have not been adequately monitored to determine their status (NMFS 1998b). Removal of this threat has allowed increased recruitment in the population, and therefore, the blue whale population in the eastern north Pacific is expected to have grown.

The blue whale population was severely depleted by commercial whaling in the twentieth century (NMFS 1998b). In the North Pacific, pre-exploitation population size is speculated to be approximately

4,900 blue whales, and the current population estimate is a minimum of 3,300 blue whales (Wade and Gerrodette 1993, NMFS 2006c).

Fisheries Interactions

Because little evidence of entanglement in fishing gear exists and large whales such as the blue whale may often die later and drift further offshore, it is difficult to estimate the numbers of blue whales killed and injured by gear entanglements. The offshore drift gillnet fishery is the only fishery that is likely to take blue whales from this stock, but no fishery mortalities or serious injuries have been observed. In addition, the injury or mortality of large whales due to interactions or entanglements in fisheries may go unobserved because large whales swim away with a portion of the net or gear. Fishermen have reported that large whales tend to swim through their nets without entangling and causing little damage to nets. (Carretta et al. 2008)

Ship Strikes

There is no record of any ship strike involving a blue whale in Alaska waters (Jensen and Silber 2004). According to NMFS, the average number of blue whale mortalities in California attributed to ship strikes was 0.6 whales per year for 2002-2006 (Carretta et al. 2008). As recently as September 2007, commercial vessels were implicated in the deaths of three blue whales in the Santa Barbara Channel off southern California. Additional mortality from ship strikes probably goes unreported because the whales do not strand, or if they do, they do not always have obvious signs of trauma. However, several blue whales have been photographed in California with large gashes in their dorsum that appear to be from ship strikes. (Carretta et al. 2008)

3.8.3.2 Fin Whale

Stock

Northeast Pacific

Regulatory Status

Fin whales (*Balaenoptera physalus*) are listed as endangered under the ESA. The Northeast Pacific stock is designated as depleted and classified as strategic under the MMPA. A draft species recovery plan for fin whales has been prepared (NMFS 2006b).

Habitat Preferences & Critical Habitat

Fin whales are found in continental shelf, slope, and oceanic waters (Gregr and Trites 2001, Reeves et al. 2002). Globally, this species tends to be aggregated in locations where populations of prey are most plentiful, irrespective of water depth, although those locations may shift seasonally or annually (Payne et al. 1986, 1990; Kenney et al. 1997; Notarbartolo-di-Sciara et al. 2003). Littaye et al. (2004) determined that fin whale distribution in the Mediterranean Sea was linked to frontal areas and upwelling within large zooplankton patches. Fin whales in the north Pacific spend the summer feeding along the cold eastern boundary currents and appear to prefer krill and large copepods, but also eat schooling fish such as Pacific herring (*Clupea harengus pallasi*), walleye pollock (*Theragra chalcogramma*), and capelin (*Mallotus villosus*) (Nemoto and Kawamura 1977, Perry et al. 1999). Critical habitat has not been designated for fin whales.

Population Size and Trends

In the north Pacific, the total pre-exploitation population size of fin whales is estimated at 42,000 to 45,000 whales (Ohsumi and Wada 1974). From whaling records, fin whales that were marked in winter 1962 to 1970 off southern California were later taken in commercial whaling operations between central

California and the GOA in summer (Mizroch et al. 1984). In summer 2003, a cetacean survey in the Shelikof Strait (north of Kodiak), Cook Inlet, Prince William Sound and on the shelf between Kodiak and Montague Island detected 165 fin whales along the shelf break and having an average group size of 2.9 observed over 57 sightings (Waite 2003). The April 2009 GOALS survey in the TMAA had 24 visual observations of fin whale groups totaling 64 individuals during a 10-day period (Rone et al. 2009).

Currently there are no reliable estimates of current or historical abundance numbers for the Northeast Pacific fin whale stock. Fin whales have a worldwide distribution, with three distinct stocks recognized in the Pacific: (1) Alaska (Northeast Pacific), (2) California/Washington/ Oregon, and (3) Hawaii. Provisional estimates for the Northeastern Pacific based on surveys in 1999 and 2000 are 3,368 (CV = 0.18) for the central-eastern Bering Sea and 683 (CV = 0.32) for the eastern Bering Sea. (Angliss and Allen 2009)

The population trend for this species estimated for 1987 to 2003 is reported as growing at 4.8 percent annually, which is consistent with the estimated growth rates of other large whales (Angliss and Allen 2009). For purposes of acoustic impact modeling, a density of 0.010 individuals per km^2 was used for fin whales in the TMAA as provided by Rone et al. (2009) and described in detail in Appendix E.

Distribution

Fin whales are broadly distributed throughout the world's oceans, usually in temperate to polar latitudes and less commonly in the tropics (Reeves et al. 2002). Single fin whales are most common, but they gather in groups, especially when good sources of prey are aggregated.

Fin whales in the North Pacific spend the summer feeding along the cold eastern boundary currents and have been observed as far north as the Chukchi and Bering Seas (Gambell 1985, Perry et al. 1999, DoN 2006, Angliss and Allen 2009). However, although fewer in number, fin whales have also been sighted in the Bering Sea all winter (Mizroch et al. 1999). Acoustic signals from fin whales are detected year-round in the GOA with most calls from August through February (Moore et al. 2006, Mizroch et al. 2009). Around Kodiak Island (in the vicinity of the TMAA) fin whales have been observed year-round with most sightings from April to September (DoN 2006).

Life History

Natural sources and rates of mortality are largely unknown, but Aguilar and Lockyer (1987) suggest annual natural mortality rates may range from 0.04 to 0.06 (based on studies of northeast Atlantic fin whales). The occurrence of the nematode *Crassicauda boopis* appears to increase the potential for kidney failure in fin whales and may be preventing some fin whale stocks from recovering from whaling (Lambertsen 1992). Killer whale or shark attacks may result in serious injury or death in very young and sick whales (Perry et al. 1999).

Reproduction/Breeding

Fin whales become sexually mature between 6 to 10 years of age, depending on density-dependent factors (Gambell 1985). Reproductive activities for fin whales occur primarily in the winter. Gestation lasts about 12 months and nursing occurs for 6 to 11 months (Perry et al. 1999). Although fin whales are present in GOA in the winter, there are no known calving areas in GOA (Mizroch et al. 2009) Peak calving is in October through January (Hain et al. 1992) and fin whales likely move south from feeding areas to give birth. There are no known areas used by fin whales for reproduction or calving in the TMAA.

Diving Behavior

Details of diving behavior and the derivation of parameters used in the acoustic modeling are presented in Appendix D. Kopelman and Sadove (1995) found significant differences in blow intervals, dive times,

and blows per hour between surface feeding and nonsurface-feeding fin whales. Various researchers have reported foraging fin whales have dive durations of approximately 4 to 15 min and to depths between approximately 200 and 500 ft (61 and 152 m) (DoN 2006). Dives are followed by sequences of four to five blows at 10- to 20-second (sec) intervals (Cetacean and Turtle Assessment Program [CETAP] 1982, Stone et al. 1992, Lafortuna et al. 2003).

Acoustics

Fin whales produce calls with the lowest frequency and highest source levels of all mysticetes. Fin whales produce a variety of sounds with a frequency range from 15 to 750 Hz (see Table 3.8-3). The long-patterned 15- to 30-Hz vocal sequence 1 second in duration with a source level of 184 to 200 dB re 1 Pa @ 1 m is most typically recorded (Richardson et al. 1995, Charif et al. 2002). Only males are known to produce infrasonic pulses, suggesting they may function as a male breeding display (Croll et al. 2002, Moore et al. 2006). Although data on hearing ability for fin whales are unavailable, it is hypothesized that based on their anatomy and vocalizations, fin whales have acute infrasonic hearing (Ketten, 1997).

Impacts of Human Activity

Historic Whaling

Between 1947 and 1987, approximately 46,000 fin whales were taken from the North Pacific by commercial whalers. In addition, approximately 3,800 were taken off the west coast of North America between 1919 and 1929. In 1976 Fin whales in the North Pacific were given protected status by the IWC. (Carretta et al. 2008)

Fisheries Interactions

The incidental take of fin whales in fisheries is extremely rare. In the California/Oregon drift gillnet fishery, observers recorded the entanglement and mortality of one fin whale, in 1999, off southern California (NMFS 2000). Based on a worst-case scenario, NMFS estimates that a maximum of six fin whales (based on calculations that adjusted the fin whale observed entangled and killed in 1999 by the number of sets per year) could be captured and killed in a given year by the California-Oregon drift gillnet fleet (NMFS 2000). Anecdotal observations from fishermen suggest that large whales swim through their nets rather than get caught in them (NMFS 2000). Because of their size and strength, fin whales probably swim through fishing nets, which might explain why these whales are rarely reported as having become entangled in fishing gear. NMFS has no records of fin whales being killed or injured by commercial fisheries operating in the North Pacific (Ferrero et al. 2000).

Vessel Collisions

Worldwide historical records indicate fin whales were the most likely species to be struck by vessels (Laist et al. 2001). For Alaska waters, the available whale-vessel collision data has been presented in an unpublished preliminary summary of opportunistically collected reports involving 62 whale-vessel collisions between 1978 and 2006 (Gabriele et al. 2006). Recognizing that this report is likely biased toward near shore reports and inland waters of Southeast Alaska where the authors were located and where nearshore vessels and a population of humpback whales overlap, there have been no recorded vessel collisions with fin whales in Alaska waters.

3.8.3.3 Humpback Whale

Stock

Central and Western North Pacific

Regulatory Status

Humpback whales are listed as endangered under the ESA. They are designated as depleted throughout their range under the MMPA and the Western North Pacific stock is classified as strategic. A final species recovery plan has been prepared (NMFS 1991).

In addition to being listing as endangered, there are regulations that have been issued governing the approach to humpback whales in Alaska waters, "within 200 miles of the coast" (NOAA 2001b). These regulations were issued to manage the threat caused by whale watching activities by: (1) prohibiting approach to within 100 yards (yd) (91.4 m) of humpback whales; (2) implementation of a "slow safe speed" in proximity to humpbacks, and (3) creating exemptions for some vessels including military vessels engaged in "official duty" (training).

Habitat Preferences & Critical Habitat

Although humpback whales typically travel over deep, oceanic waters during migration, their feeding and breeding habitats are mostly in shallow, coastal waters over continental shelves (Clapham and Mead 1999). Shallow banks or ledges with high sea-floor relief characterize feeding grounds (Payne et al. 1990, Hamazaki 2002). The habitat requirements of wintering humpbacks appear to be determined by the conditions necessary for calving and breeding consisting mainly of relatively shallow or protected areas around and between islands, over banks, and along continental coasts. Critical habitat has not been designated for humpback whales in the North Pacific.

Population Size and Trends

Three Pacific stocks of humpback whales are recognized in the Pacific Ocean and include the Western North Pacific stock, Central North Pacific stock, and ENP stock (Calambokidis et al. 1997, Baker et al. 1998). In the entire North Pacific Ocean basin prior to 1905, it is estimated that there were 15,000 humpback whales basin-wide (Rice 1978). Whaling in the North Pacific continued until 1976 by the Japanese and Soviet pelagic whaling fleets. After the end of commercial whaling, approximate humpback numbers were estimated to be between 1,200 to 1,400 whales (Calambokidis et al. 2008), although it is unclear if estimates were for the entire north Pacific or just the eastern north Pacific. The population of humpbacks in the Pacific is increasing and has undergone substantial recovery since the end of whaling. The Structure of Populations, Levels of Abundance and Status of Humpback Whales in the North Pacific (SPLASH) study suggested the current (2008) best estimate for the overall abundance in the North Pacific is 18,302 (Calambokidis et al., 2008).

It has been recently estimated there are 3,000 to 5,000 humpback whales in the GOA area (Calambokidis et al. 2008). The best abundance estimate for the Central North Pacific Stock, is 4,005 (CV = 0.095) individuals (Angliss and Allen 2009). In summer 2003, a survey in the Shelikof Strait (north of Kodiak), Cook Inlet, Prince William Sound and between Kodiak and Montague Island detected 128 humpbacks whales along the shelf break and having an average group size of 2.7 (Waite 2003). An April 2009 survey in the TMAA had 11 visual observations of humpback groups totaling 20 individuals during a 10-day period (Rone et al. 2009). Density for the entire TMAA was 0.0019/km^2 (Table 9, Rone et al. 2009) for the April-December timeframe (Table 3.8-2) as described in detail in Appendix E. As the humpback whales tend to prefer shallow water and are concentrated nearshore over the shelf, this is likely an overestimate for humpback density in the TMAA.

Distribution

Humpback whales live in all major ocean basins from equatorial to subpolar latitudes, migrating from tropical breeding areas to polar or subpolar feeding areas (Jefferson et al. 1993, NMFS 2006c). North Pacific humpback whales are distributed primarily in four more-or-less distinct wintering areas: the

Ryukyu and Ogasawara (Bonin) Islands (south of Japan), the Hawaiian Islands, the Revillagigedo Islands off Mexico, and along the coast of mainland Mexico (Calambokidis et al. 2008). There is known to be some interchange of whales among different wintering grounds, and matches between Hawaii and Japan and Hawaii and Mexico have been found (Calambokidis et al. 2008). However, it appears that the overlap is relatively small between the western north Pacific humpback whale population and Central North Pacific and ENP populations (Calambokidis et al. 2008).

Humpbacks in the Pacific are generally found during the summer on high-latitude feeding grounds in a nearly continuous band from southern California to the Aleutian Islands, Kamchatka Peninsula, and the Bering and Chukchi seas (Calambokidis et al. 2001). The U.S./Canada border is an approximate geographic boundary between the California and Alaska feeding groups (Carretta et al. 2006). There is much interchange of whales among different feeding grounds, although some site fidelity occurs.

During the winter, humpbacks generally migrate to the tropics and subtropics where they can be found around islands, over shallow banks, and along continental coasts, where calving and breeding occur. Humpbacks have one of the longest migrations known for any mammal with individuals traveling nearly 4,320 nm (8,000 km) between feeding and breeding areas (Clapham and Mead 1999). Most humpback whale sightings are in nearshore and continental shelf waters; however, humpback whales frequently travel through deep water during migrations such as the route to and from the Hawaiian Islands (Clapham and Mattila 1990, Calambokidis et al. 2001). Migratory transits between the Hawaiian Islands and southeastern Alaska have been documented to take as little as 36 to 39 days (Gabriele et al. 1996, Calambokidis et al. 2001).

In the GOA, peak abundance occurs in late November and early December and slowly declines in January as humpback whales migrate to southerly breeding grounds (Consiglieri et al. 1982, Straley 1990, DoN 2006). Humpback whales that have migrated south begin to return to Alaskan feeding grounds in April (Consiglieri et al. 1982).

Identifications made between feeding areas and wintering areas indicate that the majority of humpbacks in the GOA winter in Hawaii (about 57 percent of the population) with the remainder wintering in Mexican waters around the Revillagigedo Islands, Baja, and the Mexican mainland (Calambokidis et al. 2008). Whales from Southeast Alaskan waters almost exclusively go to Hawaii. However, approximately 15 to 17 percent of the whales identified in the Western GOA could not be matched to known wintering areas, suggesting the existence of undocumented humpback wintering area(s) (Calambokidis et al. 2008). As noted previously, a small number of humpbacks humpback whales occur in the GOA year-round (DoN 2006).

Life History

Humpbacks primarily feed on small schooling fish and krill (Angliss and Allen 2009). The whales primarily feed along the shelf break and continental slope (Green et al. 1992, Tynan et al. 2005).

Reproduction/Breeding

Humpback whales migrate to calving/breeding grounds (e.g. Hawaii and Central America) in the lower latitudes each winter (Calambokidis et al. 2008). There are no known areas used by humpback whales for reproduction or calving in the TMAA.

Diving Behavior

Details of diving behavior and the derivation of parameters used in the acoustic modeling are presented in Appendix D. Humpback whale diving behavior depends on the time of year (Clapham and Mead 1999). In summer, most dives last less than 5 min; those exceeding 10 min are atypical. Although humpback

whales have been recorded to dive as deep as about 1,638 ft (500 m) (Dietz et al. 2002), on the feeding grounds they spend the majority of their time in the upper 400 ft (120 m) of the water column (Dolphin 1987, Dietz et al. 2002). In winter, dives average 10 to 15 min; dives of greater than 30 min have been recorded (Clapham and Mead 1999) and with recorded dives to 577 ft (176 m) (Baird et al. 2000).

Acoustics

Humpback whales produce three classes of vocalizations: (1) "songs" in the late fall, winter, and spring by solitary males primarily on wintering grounds and much less frequently on northern feeding grounds; (2) sounds made within groups on the wintering (calving) grounds; and (3) social sounds made on the feeding grounds (Thomson and Richardson 1995). The best-known types of sounds produced by humpback whales are songs, which are thought to be breeding displays used only by adult males (Helweg et al. 1992). Singing is most common on breeding grounds during the winter and spring, but is occasionally heard on feeding grounds outside breeding areas and season (Matilla et al. 1987, Clark and Clapham 2004). There is geographical variation in humpback whale song, with different populations singing different songs, and all members of a population using the same basic song. The song evolves over the course of a breeding season, but remains nearly unchanged from the end of one season to the start of the next (Payne et al. 1983). Social calls are from 50 Hz to over 10 kilohertz (kHz), with the highest energy below 3 kHz (Silber, 1986).

Female humpback whale vocalizations appear to be simple: Simão and Moreira (2005) noted little complexity. The male song, however, is complex and changes between seasons. Components of the song range from under 20 Hz to 4 kHz and occasionally 8 kHz, at source levels of 144 to 174 dB re 1 µPa @ 1 m, with a mean of 155 dB re 1 µPa @ 1 m. The main energy lies between 0.2 and 3.0 kHz, with frequency peaks at 4.7 kHz (Table 3.8-3). Au et al. (2001) reported source levels (between 171 and 189 dB re 1 µPa @ 1 m) of humpback whale songs.

No tests of humpback whale hearing have been made. Houser et al. (2001) constructed a humpback audiogram using a mathematical model based on the internal structure of the ear. The predicted audiogram indicates sensitivity to frequencies from 700 Hz to 10 kHz, with maximum relative sensitivity between 2 kHz and 6 kHz. Au et al. (2006) took recordings of whales off Hawaii and found high-frequency harmonics of songs extending beyond 24 kHz, which may indicate that they can hear at least as high as this frequency. A single study suggested that humpback whales responded to mid-frequency active (MFA) sonar (3.1 to 3.6 kHz) sound (Maybaum 1989). The hand-held sonar system had a sound artifact below 1,000 Hz which caused a response to the control playback (a blank tape) and may have affected the response to sonar (i.e., the humpback whale responded to the low-frequency artifact rather than the MFA sonar sound).

Impacts of Human Activity

Historic Whaling

Commercial whaling, the single most significant population impact on humpback whales, ceased operation in the Pacific Ocean in 1966. Intensive commercial whaling removed more than 28,000 animals from the North Pacific during the 20th century. From 1961 to 1971, an additional 6,793 humpback whales were killed illegally by the former Soviet Union. Many animals during this time were taken from the GOA and Bering Sea; however, catches occurred across the North Pacific, from the Kuril Islands to the Queen Charlottes, and additional illegal catches in earlier years may have gone unrecorded (Angliss and Allen 2009).

Fisheries Interactions

Entanglement in fishing gear poses a threat to individual humpback whales throughout the Pacific. A number of fisheries based out of West Coast ports may incidentally take the ENP stock of humpback whales, and documented interactions are summarized in the U.S. Pacific Marine Mammal Stock Assessments: 2006 (Carretta et al. 2007). The estimated impact of fisheries on the ENP humpback whale stock is probably underestimated; the serious injury or mortality of large whales from entanglement in gear may go unobserved because whales swim away with a portion of the net, line, buoys, or pots. In 1996 and again in 2001, gear traced to fishing activities in Alaska were removed from two entangled humpback whales in Hawaii. According to the NMFS Pacific Islands Region Marine Mammal Response Network Activity Update (dated July 2007 [NMFS 2007b]), there were reports of 26 distressed marine mammals in Hawaii found entangled in fishing gear for the 6-month period, November to April 2007.

NMFS estimates that between 2002 and 2006, there were incidental serious injuries to 0.2 humpback annually in the Bering Sea/Aleutian Islands sablefish longline fishery. This estimation is not considered reliable. Observers have not been assigned to a number of fisheries known to interact with the Central and Western North Pacific stocks of humpback whale. In addition, the Canadian observation program is also limited and uncertain. (Angliss and Allen 2009)

Ship Strikes

Humpback whales, especially calves and juveniles, are highly vulnerable to ship strikes and other interactions with nonfishing vessels. Younger whales spend more time at the surface, are less visible, and are found closer to shore (Herman et al. 1980, Mobley et al. 1999), thereby making them more susceptible to collisions. Nine ship strikes were implicated in mortality or serious injuries of humpback whales between 2001 and 2005. Seven of these ship strikes occurred in Southeast Alaska and two occurred in the northern portion of the Central North Pacific's range (Angliss and Allen 2009). Additional mortality from ship strikes probably goes unreported because the whales do not strand or, if they do, they do not have obvious signs of trauma.

Whale-watching tours are becoming increasingly popular, and ship strikes have risen in recent years. Regulations governing the approach to humpback whales in Alaska were promulgated in 2001 to manage the threat caused by whale watching activities (NOAA 2001b). Two whale watch vessel strikes in Alaska waters have also involved humpback whales (Jensen and Siber, 2004). Available whale-vessel collision data presented in an unpublished preliminary summary indicates that most of the 62 recorded collisions between vessels and whales in Alaska waters involve humpback whales (Gabriele et al. 2006).

As noted previously, many of the humpbacks feeding in GOA winter in Hawaii. In the Hawaiian Islands, ship strikes of the humpback whale are of particular concern. According to the NMFS Pacific Islands Region Marine Mammal Response Network Activity Update (dated January 2007 [NMFS 2007]), there were nine reported collisions with humpback whales in 2006 (none involved the Navy).

Whale Watching Disturbance

Whale-watching boats and scientific research vessels specifically direct their activities toward whales, and may have direct or indirect impacts on humpback whales. The growth of the whale-watching industry has not increased as rapidly for the ENP stock of humpback whales as it has for the Central North Pacific stock (wintering grounds in Hawaii and summering grounds in Alaska), but whale-watching activities do occur throughout the ENP stock's range. There is concern regarding the impacts of close vessel approaches to large whales because harassment may occur, preferred habitats may be abandoned, and fitness and survivability may be compromised if disturbance levels are too high. While a 1996 study in Hawaii measured the acoustic noise of different whale-watching boats (Au and Green 2000) and determined that the sound levels were unlikely to produce grave effects on the humpback whale auditory system, the potential direct and indirect effects of harassment due to vessels cannot be discounted. Several

investigators have suggested that shipping noise may have caused humpback whales to avoid or leave feeding or nursery areas (Jurasz and Jurasz 1979, Dean et al. 1985), while others have suggested that humpback whales may become habituated to vessel traffic and its associated noise. Still other researchers suggest that humpback whales may become more vulnerable to vessel strikes once they habituate to vessel traffic (Swingle et al. 1993, Wiley et al. 1995).

Other Threats

Humpback whales are potentially affected by a resumption of commercial whaling, loss of habitat, loss of prey (for a variety of reasons including climate variability), underwater noise, and pollutants. Very little is known about the effects of organochlorine pesticides, heavy metals, polychlorinated biphenyls, and other toxins on baleen whales, although the impacts may be less than higher trophic level odontocetes due to baleen whales' lower levels of bioaccumulation from prey (Angliss and Allen 2009).

Anthropogenic noise may also affect humpback whales, because humpback whales seem to respond to moving sound sources, such as whale-watching, fishing, and recreational vessels and low-flying aircraft (Richardson et al. 1995). Their responses to noise are variable and affected by the context of the exposure and the animal's experience, motivation, and conditioning (Wartzok et al. 2003, Southall et al. 2007).

3.8.3.4 North Pacific Right Whale

Stock

Eastern North Pacific

Regulatory Status

North Pacific right whales (*Eubalaena japonica*) are classified as endangered under the ESA and are considered one of the world's most endangered large whale species. The right whale is designated as depleted and the ENP stock is classified as strategic under the MMPA. (DoN 2006)

Habitat Preferences & Critical Habitat

Feeding habitat for right whales is defined by the presence of sufficiently high densities of prey, especially zooplankton (calanoid copepods). Development of those patches is essentially a function of oceanic conditions, such as stratification, bottom topography, and currents which concentrate zooplankton, and concentration is probably enhanced by the behavior of the organisms themselves. The apparent shift in Bering Sea right whale occurrences from deep waters in the mid-twentieth century to the mid-shelf region in the late 1900s was attributed to changes in the availability of optimal zooplankton patches, possibly relating to climatic forcing (variability in oceanic conditions caused by changes in atmospheric patterns). Sightings in the Bering Sea have been clustered in relatively shallow water (waters with a bottom depth of 164 to 262 ft (50 to 80 m). Information from a tagged individual documented movement between the middle and outer portions of the continental shelf in the Bering Sea, which is consistent with historical distribution patterns. Additionally, sightings of some other right whale individuals during the 2004 survey were made on the outer continental shelf (DoN 2006).

North Pacific right whales in locations other than Alaska waters have been sighted in even deeper depths, as evidenced by a sighting off California with a bottom depth as deep as 5,577 ft (1,700 m). The International Whaling Commission (IWC) noted a surprising absence of evidence for coastal calving grounds, since right whales in the North Atlantic and in the Southern Hemisphere have calving grounds located in shallow bays, lagoons, or in waters over the continental shelf (DoN 2006).

Sightings of North Pacific right whales in 1996 during an Alaska Fisheries Science Center groundfish assessment cruise led to intense photoidentification and vessel surveys from 1998 to 2004 in the south-eastern Bering Sea. According to Moore et al. (2006), the sighting locations indicated that right whales

preferred the relatively shallow waters of the southeastern Bering Sea middle shelf, which are approximately 230 ft (70 m) in depth. Also determined during these surveys was that right whale calls occurred from May through November, with the greatest number of calls recorded in September and October (Moore et al. 2006).

In July 1998, a lone North Pacific right whale was sighted among humpback whales during an aerial survey southeast of Kodiak Island. Acoustic surveys of this area produced very few North Pacific right whale calls; however, unambiguous right whale calls were detected in August and early September in western GOA. In addition calls were recorded from locations where right whales were formerly abundant but have not been seen in recent decades (Moore et al. 2006).

In August 2004, a NMFS researcher observed a single right whale among a group of humpbacks. In August 2005, a NMFS researcher reported yet another sighting of a right whale within 820 to 1,640 ft (250 to 500 m) of groups of humpback and fin whales. (Angliss and Allen 2009) There were no right whales detected acoustically or visually during the April 2009 survey of the TMAA (Rone et al. 2009).

In May 2008, NMFS issued a final rule designating two areas as North Pacific right whale critical habitat, one in the GOA and one in the Bering Sea. The location of the critical habitat for North Pacific right whales in the GOA is shown on Figure 3.8-1. This area is located beyond approximately 16 nm (30 km) west of the southwest corner of the TMAA. The final rule for this critical habitat designation cites consistent sightings of right whales—both single individuals and pairs—in specific areas in spring and summer over an extended period as an indicator of primary constituent element (dense concentrations of prey) in a feeding area. While sightings of right whales are fewer in number in the GOA than in the Bering Sea, just prior to the final rule three individuals were sighted in the critical habitat area in the GOA (Angliss and Allen 2009).

Population Size and Trends

There are no reliable estimates of current abundance or trends for right whales in the North Pacific, and the population may only number at least in the low hundreds (Angliss and Allen 2009). There are not sufficient numbers of individuals of this species present in the TMAA to allow for acoustic impact modeling, given they are rare. The population in the eastern north Pacific is considered to be very small, perhaps only in the tens of animals. Over the past 40 years, most sightings in the eastern north Pacific have been of single whales. However, during the last few years, small groups of right whales have been sighted (such as the group of 17 documented in 2004; Angliss and Allen 2009). An analysis of both photoidentification and biopsy efforts in 2004 in the Bering Sea revealed 17 individuals. However, of 13 individual animals photographed during aerial surveys in 1998, 1999, and 2000, 2 have already been rephotographed. This photographic recapture rate is consistent with a very small population size (Angliss and Outlaw 2006). Observers in 2002 and 2004 reported one confirmed calf sighting and two probable calves (Angliss and Allen 2009). Recently, photographic and genotype data were used to estimate right whale abundance in the Bering Sea and Aleutian Islands using the two data sets (Wade et al. 2010). The estimates were very similar with photoidentification indicating 31 individuals[1] and biopsy genotyping indicating 28 individuals[2] (Wade et al. 2010). Researchers also estimated the population contains eight females[3] and 20 males[4]. Although these estimates may relate to a Bering Sea subpopulation, they are consistent with previous findings suggesting that the total eastern North Pacific population is unlikely to be much larger.

[1] Common Language effect size (CL) statistic at 95%, CL 23–54. For purposes of this discussion, CL measures the difference between the numbers provided by the two data sets in terms of the probability that a number sampled at random from the first dataset will be greater than a number sampled at random from the second.

[2] 95% CL 24–42

[3] 95% CL 7–18

[4] 95% CL 17–37

Distribution

Right whales occur in subpolar to temperate waters. They are generally migratory, with at least a portion of the population moving between summer feeding grounds in temperate or high latitudes and winter calving areas in warmer waters (DoN 2006). However, Right whale calls have been detected as early as May and as late as November in southeast Bering Sea region (Munger et al. 2008).

Current distribution patterns and migration routes of North Pacific right whales are not known. Historical whaling records provide virtually the only information on North Pacific right whale distribution. North Pacific right whales historically occurred across the Pacific Ocean north of 35°N, with concentrations in the GOA south of Kodiak Island, the eastern Aleutian Islands, south-central Bering Sea, Okhotsk Sea, and the Sea of Japan. Presently, sightings are extremely rare, occurring primarily in the Okhotsk Sea and the eastern Bering Sea in roughly the same location. There is evidence that the GOA was used as a feeding ground, and recent surveys suggest that some individuals continue to use the shelf east of Kodiak as a feeding area, which has now been designated as critical habitat. It is not known whether there is an interchange between the Bering Sea and GOA areas; for example, an individual right whale that was photographed off Kodiak Island did not match to any photographs of individuals seen in the Bering Sea (DoN 2006, Moore et al. 2006).

The area of densest concentration of North Pacific right whales in the GOA is roughly east from 170°W to 150°W and south to 52°N. (DoN 2006). In GOA off Kodiak Island, sightings of a single lone right whale have occurred in 1998, 2004, 2005, and 2006 (Angliss and Allen 2009). Many of the recent sightings of right whales in GOA are individuals seen in association with humpback whales.

There have since been 10 acoustic detections of probable right whale calls off the continental shelf near Kodiak Island (Moore et al. 2006).

The highly endangered status of North Pacific right whales necessitates an extremely conservative determination of this species' occurrence in the GOA. Right whales will be rare in the TMAA due to the small number in population. There is sparse survey effort during the winter, and this species is believed to be largely absent in Alaska waters during December through April. It is assumed right whales would be on their breeding grounds, which are likely located further south, although the location of the breeding grounds is unknown (DoN 2006).

Life History

Feeding habitat for right whales is defined by the presence of sufficiently high densities of prey, especially calanoid copepods. Development of those patches is essentially a function of oceanic conditions, such as stratification, bottom topography, and currents which concentrate zooplankton, and concentration is probably enhanced by the behavior of the organisms themselves. The apparent shift in Bering Sea right whale occurrences from deep waters in the mid-twentieth century to the mid-shelf region in the late 1900s was attributed to changes in the availability of optimal zooplankton patches, possibly relating to climatic forcing (variability in oceanic conditions caused by changes in atmospheric patterns).

Sightings in the Bering Sea are clustered in relatively shallow water (waters with a bottom depth of 50 m to 80 m [164 to 262 ft]). Recently, however, a tagged individual moved between the middle and outer portions of the continental shelf in the Bering Sea, which is consistent with historical distribution patterns.

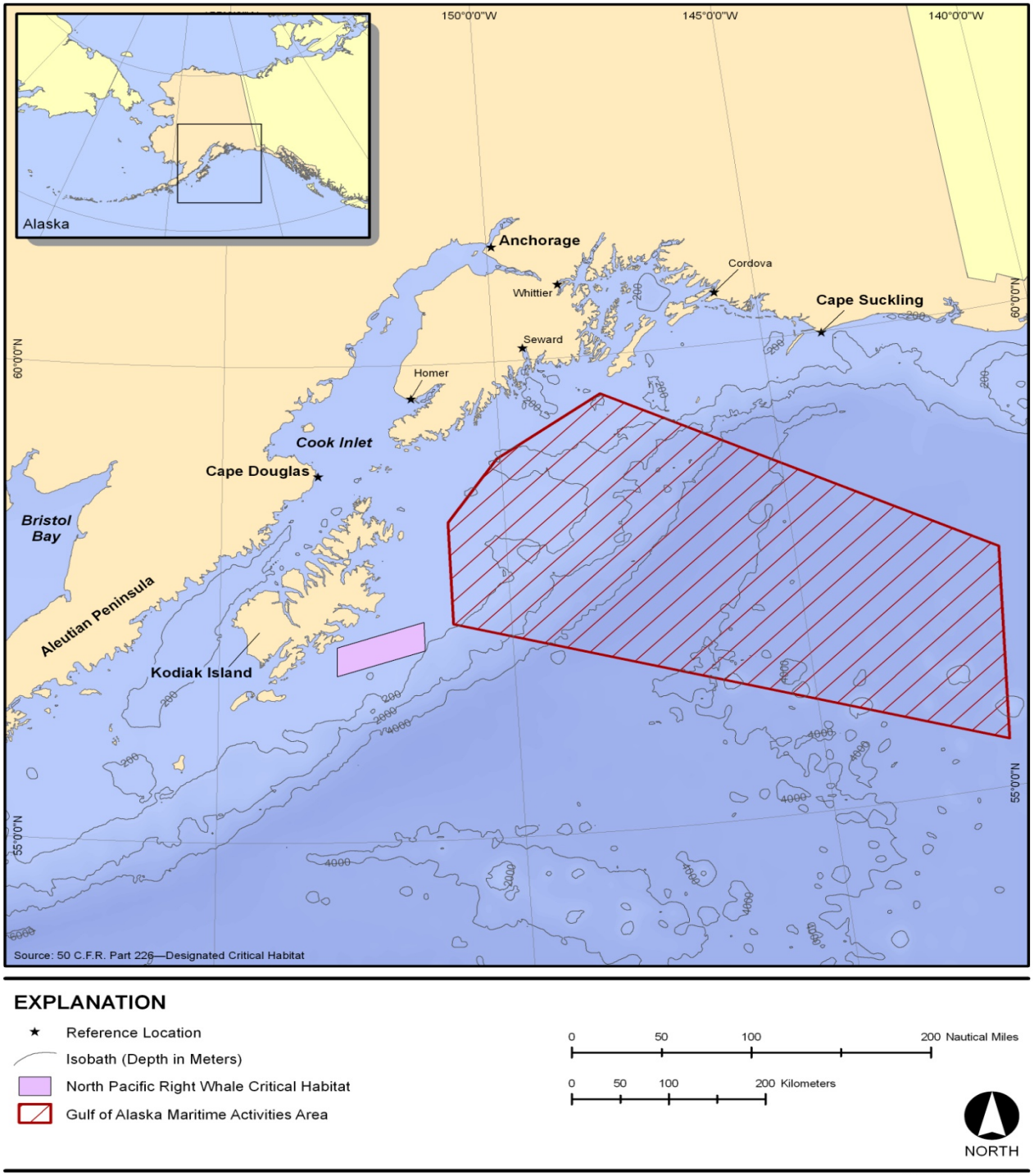


Figure 3.8-1: Right Whale Critical Habitat in the Vicinity of the TMAA

Additionally, sightings of some other right whale individuals during the 2004 survey were made on the outer continental shelf. In other locations, North Pacific right whales have been sighted in even deeper waters, as evidenced by a sighting off California in waters with a bottom depth as deep as 1,700 m (5,577 ft). The IWC noted a surprising absence of evidence for coastal calving grounds, since right whales in the

North Atlantic and in the Southern Hemisphere have calving grounds located in shallow bays, lagoons, or in waters over the continental shelf (DoN 2006).

Reproduction/Breeding

The location of calving grounds for the eastern North Pacific population is unknown. There were no records in the last 100 years of newborn or very young calves in the eastern North pacific until 2004 when the presence of at least two calves was documented in the eastern Bering Sea (DoN 2006). There are no known areas used by right whales for reproduction or calving in the TMAA.

Diving Behavior

There is almost nothing known of North Pacific right whale diving abilities. Dives of 5 to 15 min or even longer have been reported for North Atlantic right whales. Observations of North Atlantic right whales found that the average depth dive was strongly correlated with both the average depth of peak copepod abundance and the average depth of the bottom mixed layer's upper surface. North Atlantic right whale feeding dives are characterized by a rapid descent from the surface to a particular depth between 262 and 574 ft (80 and 175 m), remarkable fidelity to that depth for 5 to 14 min, and then rapid ascent back to the surface. Longer surface intervals have been observed for reproductively active females and their calves (DoN 2006).

Acoustics

North Pacific right whale calls are classified into five categories: (1) up, (2) down-up, (3) down, (4) constant, and (5) unclassified. The "up" call is the predominant type and is typically a signal sweeping from about 90 to 150 Hz in 0.7 sec. Right whales commonly produce calls in a series of 10 to 15 calls lasting 5 to 10 min, followed by silence lasting an hour or more. Some individuals do not call for periods of at least 4 hours. Morphometric analyses of the inner ear of right whales resulted in an estimated hearing frequency range of approximately 0.01 to 22 kHz, based on established marine mammal models (see Table 3.8-3).

Nowacek et al. (2004, 2007) documented observations of the behavioral response of North Atlantic right whales exposed to alert stimuli (containing mid-frequency components) in an experiment to help develop a potential ship strike avoidance tool. To assess risk factors involved use of the tool, a multisensor acoustic tag was used to measure the responses of whales to passing ships and experimentally tested their responses to the controlled exposures to various alert stimuli sounds, which included recordings of ship noise, the social sounds of conspecifics, and a signal designed to alert the whales. The alert signal was 18 min of exposure consisting of three 2-min signals played sequentially three times over. The three signals had a 60-percent duty cycle and consisted of (1) alternating 1-sec pure tones at 500 Hz and 850 Hz; (2) a 2-sec logarithmic down-sweep from 4,500 Hz to 500 Hz; and (3) a pair of low (1,500 Hz) to high (2,000 Hz) sine wave tones amplitude modulated at 120 Hz and each 1-sec long. The purposes of the alert signal were (1) to provoke an action from the whales via the auditory system with disharmonic signals that cover the whales' estimated hearing range, (2) to maximize the signal to noise ratio (obtain the largest difference between background noise), and (3) to provide localization cues for the whale.

At maximum received levels ranging from 133 to 148 dB re 1µPa/√Hz, five out of six whales reacted to the signal designed to elicit a behavioral reaction. The reaction documented, however, was that the whales ceased feeding and came to the surface, which is not a desired effect given the purpose for the exposure was meant as an alert signal to prevent whale/ship interactions.

Impacts of Human Activity

Historic Whaling

Since right whales are considered large, slow-swimming whales and have a thick layer of blubber which results in their floating when killed, they were an easy and profitable species for early (pre-modern) whalers. It has been estimated that between 26,500 and 37,000 right whales were killed during the period from 1839 to 1909. From 1900 to 1999, a total of 742 North Pacific right whales were killed by whaling; of those, 331 were killed in the western North Pacific and 411 in the eastern north Pacific. This includes 372 whales killed illegally by the former U.S.S.R. in the period from 1963 to 1967, primarily in the GOA and Bering Sea (Angliss and Allen 2009).

Fisheries Interactions

Gillnets were implicated in the death of a right whale off the Kamchatka Peninsula (Russia) in October of 1989. No other incidental takes of right whales are known to have occurred in the North Pacific. Based on the available records, the estimated annual mortality rate incidental to U.S. commercial fisheries approaches zero whales per year from this stock. Therefore, the annual human-caused mortality level is considered to be insignificant and approaching a zero mortality and serious injury rate (Angliss and Outlaw 2006).

Ship Strikes

In the North Pacific, ship strikes and entanglements may pose a threat to right whales but information is lacking. Using what is known for the North Atlantic right whale, the species seems generally unresponsive to vessel sounds and given they are slow moving, they are susceptible to vessel collisions (Nowacek et al. 2004). In contrast to conditions for the North Atlantic right whale, however, ship strikes and entanglement impacts to the North Pacific right whale population may pose less of a threat because of their rare occurrence and scattered distribution in the GOA (NMFS 2007b). Thus, the estimated annual rate of human-caused mortality and serious injury appears minimal (Angliss and Outlaw 2006).

3.8.3.5 Sei Whale

Stock

Eastern North Pacific

Regulatory Status

Sei whales (*Balaenoptera borealis*) are listed as endangered under the ESA. A species recovery plan has not been prepared. The ENP stock is considered a "depleted" and "strategic" stock under the MMPA.

Habitat Preferences & Critical Habitat

Sei whales are most often found in deep, oceanic waters of the cool temperate zone. They appear to prefer regions of steep bathymetric relief, such as the continental shelf break, canyons, or basins situated between banks and ledges. These areas are often the location of persistent hydrographic features, which may be important factors in concentrating zooplankton, especially copepods. On the feeding grounds, the distribution is largely associated with oceanic frontal systems. In the north Pacific, sei whales are found feeding particularly along the cold eastern currents. Characteristics of preferred breeding grounds are unknown. In the north Pacific, sei whales particularly feed along the cold eastern currents. In the north Pacific, prey includes calanoid copepods, krill, fish, and squid. (DoN 2006). Critical habitat has not been designated for the ENP stock of sei whales.

Population Size and Trends

The IWC groups all sei whales in the North Pacific Ocean into one stock (Donovan 1991). Mark-recapture, catch distribution, and morphological research, however, indicated that more than one stock exists: one between 175°W and 155°W longitude, and another to the east of 155°W longitude (Masaki 1976, 1977). In the U.S. Pacific Exclusive Economic Zone (EEZ), only the ENP Stock is recognized. Worldwide, sei whales were severely depleted by commercial whaling activities. In the north Pacific, the pre-exploitation population estimate for sei whales is 42,000 whales, and the most current population estimate for sei whales in the entire north Pacific (from 1977) is 9,110 (NMFS 2006c).

Application of various models to whaling catch and effort data suggests that the total population of adult sei whales in the north Pacific declined from about 42,000 to 8,600 between 1963 and 1974 (Tillman 1977). Since 500 to 600 sei whales per year were killed off Japan from 1910 to the late 1950s, the stock size presumably was already, by 1963, below its carrying capacity level (Tillman 1977). Currently, the best estimate for the ENP stock is 43 (CV = 0.61) individuals (Carretta et al. 2007). There are not sufficient numbers of individuals of this species present in the TMAA to allow for acoustic impact modeling, given they are few in number.

Distribution

Sei whales have a worldwide distribution and are currently found primarily in cold temperate north Pacific (north of 40°N) to subpolar latitudes (as far south as 20°N), rather than in the tropics or near the poles. Sei whales range as far south as Baja California, Mexico, Hawaii, and Guam in the Northern Marianas Islands. Whaling data suggest that the northern limit for this species was about 55°N. Sei whales are usually observed singly or in small groups of 2 to 5 animals, but are occasionally found in larger (30 to 50) loose aggregations (DoN 2006).

Sei whales are also known for occasional irruptive occurrences in areas followed by disappearances for sometimes decades. Currently in the Alaskan waters, sei whales are thought to occur mainly south of the Aleutian Islands. Whaling records from the 1900s indicate there were high densities of sei whales in the northwestern and northeastern portions (i.e., near Portlock Bank) of the GOA during May through August (DoN 2006). There were no sei whales detected during the April 2009 survey of the TMAA (although there were sightings of 38 unidentified large whales; Rone et al. 2009).

Life History

In the North Pacific, sei whales particularly feed along the cold eastern currents (Perry et al. 1999). In the North Pacific, prey includes calanoid copepods, krill, fish, and squid (Nemoto and Kawamura 1977). The dominant food for sei whales off California during June through August is the northern anchovy, while in September and October they eat mainly krill (Rice 1977). The location of winter breeding areas and characteristics of preferred breeding grounds are unknown (Rice 1998, Perry et al. 1999).

Reproduction/Breeding

No breeding areas have been determined but calving is thought to occur from September to March (Rice 1977) and sei whales likely move south for breeding/calving. Their reproductive cycle is about 2 years (Gambell 1985). There are no known areas used by sei whales for reproduction or calving in the TMAA.

Diving Behavior

There are no reported diving depths or durations for sei whales. Sei whales are capable of diving 5 to 20 min to opportunistically feed on plankton (e.g., copepods and krill), small schooling fish, and cephalopods (e.g., squid) by both gulping and skimming (DoN 2006).

Acoustics

Sei whale vocalizations have been recorded on a few occasions. In the North Atlantic off Canada, recorded sounds from sei whales consisted of 10 to 20 short duration frequency-modulated sweeps between 1.5 and 3.5 kHz; source level unknown (Richardson et al. 1995). Sei whales were also recorded in the Antarctic having produced broadband "growls" and "whooshes" at an average frequency of 433 Hz (see Table 3.8-3) and source level of approximately 156 dB re 1 µPa @ 1 m (McDonald et al. 2005). While no data on hearing ability for this species are available, it has been hypothesized that mysticetes have acute infrasonic hearing (DoN 2006).

Impact of Human Activity

Historic Whaling

Several hundred sei whales in the North Pacific were taken each year by whalers based at shore stations in Japan and Korea between 1910 and the start of World War II (Committee for Whaling Statistics 1942). Small numbers were taken sporadically at shore stations in British Columbia from the early 1900s until the 1950s, when their importance began to increase (Pike and MacAskie 1969). More than 2,000 were killed in British Columbia waters between 1962 and 1967, when the last whaling station in western Canada closed (Pike and MacAskie 1969). Small numbers were taken by shore whalers in Washington (Scheffer and Slipp 1948) and California (Clapham et al. 1997) in the early 20th century, and California shore whalers took 386 from 1957 to 1971 (Rice 1977). Perry et al. (1999) reports that from 1910 to 1975, approximately 74,215 sei whales were caught in the entire North Pacific Ocean. Tillman (1977) reported that heavy exploitation by pelagic whalers began in the early 1960s, with total catches throughout the North Pacific averaging 3,643 per year from 1963 to 1974 (total 43,719; annual range 1,280-6,053), while Barlow et al. (1997) reported the capture of sei whales in the North Pacific was 61,500 between 1947 and 1987.

A major area of discussion in recent years has been IWC member nations issuing permits to kill whales for scientific purposes. Since the moratorium on commercial whaling came into effect Japan, Norway, and Iceland have issued scientific permits as part of their research programs. For the last 5 years, only Japan has issued permits to harvest sei whales although Iceland asked for a proposal to be reviewed by the IWC Scientific Committee in 2003. The Government of Japan has issued scientific permits in recent years to capture minke, Bryde's, and sperm whales in the North Pacific, known as JARPA II and JARPN II programmes. The Government of Japan extended the captures to include 50 sei whales from pelagic areas of the western North Pacific (Carretta et al. 2007).

Fisheries Interactions

Sei whales, because of their offshore distribution and relative scarcity in U.S. Atlantic and Pacific waters, probably have a lower incidence of entrapment and entanglement than fin whales. Data on entanglement and entrapment in non-U.S. waters are not reported systematically. Heyning and Lewis (1990) made a crude estimate of about 73 rorquals killed/year in the southern California offshore drift gillnet fishery during the 1980s. Some of these may have been fin whales instead of sei whales. Some balaenopterids, particularly fin whales, may also be taken in the drift gillnet fisheries for sharks and swordfish along the Pacific coast of Baja California, Mexico (Barlow et al. 1997). Heyning and Lewis (1990) suggested that most whales killed by offshore fishing gear do not drift far enough to strand on beaches or to be detected floating in the nearshore corridor where most whale-watching and other types of boat traffic occur. Thus, the small amount of documentation may not mean that entanglement in fishing gear is an insignificant cause of mortality. Observer coverage in the Pacific offshore fisheries has been too low for any confident assessment of species-specific entanglement rates (Barlow et al. 1997). The offshore drift gillnet fishery is the only fishery that is likely to take sei whales from this stock, but no fishery mortalities or serious injuries to sei whales have been observed. Sei whales, like other large whales, may break through or carry

away fishing gear. Whales carrying gear may die later, become debilitated or seriously injured, or have normal functions impaired, but with no evidence recorded.

Ship Strikes

The decomposing carcass of a sei whale was found on the bow of a container ship in Boston harbor, suggesting that sei whales, like fin whales, are killed at least occasionally by ship strikes (Waring et al. 1997). Sei whales are observed from whale-watching vessels in eastern North America only occasionally (Edds et al. 1984) or in years when exceptional foraging conditions arise (Weinrich et al. 1986, Schilling et al. 1992). There is no comparable evidence available for evaluating the possibility that sei whales experience significant disturbance from vessel traffic. During 2000-2004, there were an additional five injuries and three mortalities of unidentified large whales attributed to ship strikes. Additional mortality from ship strikes probably goes unreported because the whales do not strand or, if they do, they do not always have obvious signs of trauma (DoN 2006).

Other Threats

No major habitat concerns have been identified for sei whales in either the North Atlantic or the North Pacific. Sei whales have a preference for copepods and euphausiids (i.e., low trophic level organisms), and may be less susceptible to the bioaccumulation of organochlorine and metal contaminants than, fin, humpback, and minke whales, all of which seem to feed more regularly on fish and euphausiids (O'Shea and Brownell 1994). Sei whales off California often feed on pelagic fish as well as invertebrates (Rice 1977). There is no evidence that levels of organochlorines, organotins, or heavy metals in baleen whales generally (including fin and sei whales) are high enough to cause toxic or other damaging effects (O'Shea and Brownell 1994). However, very little is known about the possible long-term and trans-generational effects of exposure to pollutants.

3.8.3.6 Sperm Whale

Stock

North Pacific

Regulatory Status

Sperm whales (*Physeter macrocephalus*) are listed as endangered under the ESA and designated as depleted under MMPA. The North Pacific stock is classified as strategic. A draft species recovery plan has been prepared (NMFS 2006a).

Habitat Preferences & Critical Habitat

Sperm whales show a strong preference for deep waters (Rice 1989), especially in areas with high sea floor relief. Recent research at the Azores Seamounts off Portugal did not, however, demonstrate association of sperm whales with seamounts (Morato et al. 2008). Globally, sperm whale distribution is associated with waters over the continental shelf break, over the continental slope, and into deeper waters (Hain et al. 1985). However, in some areas, such as off New England, on the southwestern and eastern Scotian Shelf, or the northern Gulf of California, adult males are reported to use waters with bottom depths less than 328 ft (100 m) and as shallow as 131 ft (40 m) (Whitehead et al. 1992, Scott and Sadove 1997, Croll et al. 1999, Garrigue and Greaves 2001, Waring et al. 2002). Worldwide, females rarely enter the shallow waters over the continental shelf (Whitehead 2003). In GOA the primary occurrence for the sperm whales is seaward of the 1640 ft (500 m) isobath (DoN 2006).

Sperm whales have a highly diverse diet. Prey includes large mesopelagic squid and other cephalopods, fish, and occasionally benthic invertebrates (Fiscus and Rice 1974, Rice 1989, Clarke 1996).

Critical habitat has not been designated for sperm whales.

Population Size and Trends

Current estimates of population abundance, status, and trends for the North Pacific stock in Alaska of sperm whales are not available. For the North Pacific, sperm whales have been divided into three separate stocks based on where they are found, designated as (1) Alaska (North Pacific stock), (2) California/Oregon/Washington, and (3) Hawaii (Angliss and Allen 2009).

Estimates of pre-whaling abundance in the North Pacific are considered somewhat unreliable, but sperm whales may have totaled 1,260,000 individuals (Angliss and Allen 2009). Approximately 258,000 sperm whales in the North Pacific were harvested by commercial whalers between 1947 and 1987 (Hill and DeMaster 1999). However, this number may be negatively biased by as much as 60 percent because of under-reporting by Soviet whalers (Brownell et al. 1998). In particular, the Bering Sea population of sperm whales (consisting mostly of males) was severely depleted (Perry et al. 1999). Catches in the north Pacific continued to climb until 1968, when 16,357 sperm whales were harvested. Catches declined after 1968, in part through limits imposed by the IWC (Rice 1989).

The following has been estimated for other stocks in the Pacific:

- California/Oregon/Washington 2,853 (CV = 0.25); Carretta et al. (2008)
- Hawaii 7,082 (CV = 0.30); Carretta et al. (2008)
- North Pacific 102,112 (CV = 0.15); Angliss and Allen (2008)

From 26 June to 15 July 2003, a survey in the Shelikof Strait (north of Kodiak), Cook Inlet, Prince William Sound and between Kodiak and Montague Island detected six sperm whales along the shelf break, with an average group size of 1.2 (Waite 2003). Data from this survey yielded a density of 0.0003/km^2, which is applicable year-round for sperm whales in the TMAA as described in detail in Appendix E. This density was based on only two "on effect" sightings, so confidence in the value is low, but it is the only data from which to derive a density that exists at this time for the region. The April 2009 survey in the TMAA recorded sperm whales acoustically in both the inshore and offshore strata but no sperm whales were detected visually (Rone et al. 2009).

Distribution

Sperm whales occur throughout all ocean basins from equatorial to polar waters, including the entire North Atlantic, North Pacific, northern Indian Ocean, and the southern oceans. Sperm whales are found throughout the North Pacific and are distributed broadly from tropical and temperate waters to the Bering Sea as far north as Cape Navarin. Male sperm whales are found from tropical to polar waters in all oceans of the world, between approximately 70°N and 70°S (Rice 1998). In the North Pacific, the distribution of females and young sperm whales is more limited year-round and generally corresponds to tropical and temperate waters approximately to 50°N latitude (at least 6 degrees south of the TMAA; Whitehead 2003). Summer surveys in the coastal waters around the central and western Aleutian Islands have found sperm whales to be the most frequently sighted large cetacean (Angliss and Allen 2009). Acoustic surveys have detected the presence of sperm whales year-round in the GOA although about twice as many are present in summer as in winter (Mellinger et al. 2004, Moore et al. 2006). Fewer detections in winter are reflected by the documented seasonal movement of whales from Canada and Japan to the GOA/Bering Sea/Aleutian Islands region (Angliss and Allen 2009).

Life History

Female sperm whales become sexually mature at about 9 years of age (Kasuya 1991). Male sperm whales take between 9 and 20 years to become sexually mature, but will require another 10 years to become large

enough to successfully compete for breeding rights (Kasuya 1991). The age distribution of the sperm whale population is unknown, but sperm whales are believed to live at least 60 years (Rice 1978). Estimated annual mortality rates of sperm whales are thought to vary by age, but previous estimates of mortality rate for juveniles and adults are now considered unreliable (International Whaling Commission 1980).

Reproduction/Breeding

Calving generally occurs in the summer at lower latitudes and the tropics (DoN 2005). Adult females give birth after about 15 months gestation and nurse their calves for 2 to 3 years. The calving interval is estimated to be about 4 to 6 years (Kasuya 1991). There are no known areas used by sperm whales for reproduction or calving in the TMAA.

Diving Behavior

Details regarding the relatively extensive dive behavior information for sperm whales are presented in Appendix D. In general, sperm whales forage during deep dives that routinely exceed a depth of 1,312 ft (400 m) and 30 min duration (Watkins et al. 2002). Sperm whales can dive to depths of over 6,562 ft (2,000 m) with durations of over 60 min (Watkins et al. 1993). Sperm whales spend up to 83 percent of daylight hours underwater (Jaquet et al. 2000, Amano and Yoshioka 2003). Males do not spend extensive periods at the surface (Jaquet et al. 2000). In contrast, females spend prolonged periods at the surface (1 to 5 hours daily) without foraging (Whitehead and Weilgart 1991, Amano and Yoshioka 2003). The average swimming speed is estimated to be 2.3 ft/sec (0.7 m/sec) (Watkins et al. 2002). Dive descents averaged 11 min at a rate of 5.0 ft/sec (1.52 m/sec), and ascents averaged 11.8 min at a rate of 4.6 ft/sec (1.4 m/sec) (Watkins et al. 2002).

Acoustics

Sperm whales produce short-duration (generally less than 3 sec), broadband clicks. These clicks range in frequency from 100 Hz to 30 kHz (Weilgart and Whitehead, 1993, 1997; Goold and Jones 1995; Thode et al. 2002), with dominant energy in two bands (2 to 4 kHz and 10 to 16 kHz). The source levels can be up to 236 dB re 1 µPa @ 1 m (Møhl et al. 2003). Thode et al. (2002) suggested that the acoustic directivity (angular beam pattern) from sperm whales must range between 10 and 30 dB in the 5- to 20-kHz region. The clicks of neonate sperm whales are very different from the usual clicks of adults, in that they are of low directionality, long duration, and low frequency (centroid frequency between 300 and 1,700 Hz) with estimated source levels between 140 and 162 dB re 1 µPa @ 1 m (Madsen et al. 2003). Clicks are heard most frequently when sperm whales are engaged in diving and foraging behavior (Whitehead and Weilgart 1991, Miller et al. 2004, Zimmer et al. 2005). These may be echolocation clicks used in feeding, contact calls (for communication), and orientation during dives. When sperm whales socialize, they tend to repeat series of clicks (codas), which follow a precise rhythm and may last for hours (Watkins and Schevill 1977). Codas are shared between individuals of a social unit, and are considered to be primarily for intragroup communication (Weilgart and Whitehead 1997, Rendell and Whitehead 2004).

The anatomy of the sperm whale's ear indicates that it hears high-frequency sounds (Ketten 1992). Anatomical studies also suggest that sperm whales have some ultrasonic hearing, but at a lower maximum frequency than many other odontocetes (Ketten 1992). Sperm whales may also possess better low-frequency hearing than some other odontocetes, although not as extraordinarily low as many baleen whales (Ketten 1992). Auditory brainstem response in a neonatal sperm whale indicated highest sensitivity to frequencies between 5 and 20 kHz (Ridgway and Carder 2001; Table 3.8-3).

Impacts of Human Activity

Historic Whaling

In 2000, the Japanese Whaling Association announced that it planned to kill 10 sperm whales and harvest 5 sperm whales. Japanese whalers took another 31 sperm whales between 2001 and 2005 (Angliss and Allen 2009). The consequence of these deaths on the status and trend of sperm whales remains uncertain, given the lack of information concerning sperm whale abundance (Institute of Cetacean Research 2010).

Fisheries Interactions

In U.S. waters in the Pacific, sperm whales have been incidentally taken only in drift gillnet operations, which killed or seriously injured an average of nine sperm whales per year from 1991-1995 (Barlow et al. 1997). Of the eight sperm whales taken by the California/Oregon drift gillnet fishery, three were released alive and uninjured (37.5 percent), one was released injured (12.5 percent), and four (50 percent) were killed (NMFS 2000). Therefore, approximately 63 percent of captured sperm whales could be killed accidentally or injured, based on the mortality and injury rate of sperm whales observed taken by the U.S. fleet from 1990 to 2000. Based on past fishery performance, sperm whales were not observed taken in every year; they were observed to be taken in 4 out of 10 years (NMFS 2000). During the 3 years the Pacific Coast Take Reduction Plan has been in place, a sperm whale was taken only once, in a set that did not comply with the Take Reduction Plan (NMFS 2000).

Interactions between sperm whales and longline fisheries in the GOA have been reported since 1995 and are increasing in frequency (Rice 1989, Hill and Mitchell 1998, Hill and DeMaster 1998). Between 2002 and 2006, there were three observed serious injuries (considered mortalities) to sperm whales in the GOA from the sablefish longline fishery (Angliss and Allen 2009). Sperm whales have also been observed in GOA feeding off longline gear (for sablefish and halibut) at 38 of the surveyed stations (Angliss and Allen 2009). Recent findings suggest sperm whales in Alaska may have learned that fishing vessel propeller cavitations (as gear is retrieved) are an indicator that longline gear with fish is present as a predation opportunity (Thode et al. 2007).

Berzin (1972) noted that there were "many" reports of sperm whales of different age classes being struck by vessels, including passenger ships and tug boats. Sperm whales spend long periods (typically up to 10 min) at the surface between deep dives (Jacquet et al. 1998). This behavior could make sperm whales more vulnerable to ship strikes. There is record of one collision between a fishing vessel and a sperm whale within the TMAA (Gabriele et al. 2006).

3.8.3.7 Steller Sea Lion

The Steller sea lion's (*Eumetopias jubatus*) range includes portions of the TMAA. The boundary between the eastern DPS and the western DPS approximately bisects the TMAA, although the TMAA is located offshore of the main habitat/foraging areas.

Stock

Eastern and Western DPS.

Regulatory Status

In 1997, NMFS reclassified Steller sea lions into two distinct subpopulations, based on genetics and population trends (Loughlin 1997, Angliss and Outlaw 2005). The western DPS was designated as endangered and includes animals at and west of Cape Suckling, Alaska (144°W; NMFS 1997c). The eastern DPS remained designated as threatened and includes animals east of Cape Suckling (NMFS 1997c, Loughlin 2002, Angliss and Outlaw 2005) that extend into southeastern Alaska, and Canada. Rookeries of the eastern DPS occur along the coasts of Oregon and California (NMFS 2008b). The Steller

sea lion is designated as depleted under MMPA. A final revised species recovery plan addresses both the eastern DPS and western DPS (NMFS 2008b).

Habitat Preferences & Critical Habitat

Steller sea lions are opportunistic predators, feeding primarily on fishes (including walleye pollock, cod, mackerel, and herring), invertebrates, and cephalopods (octopus and squid), with diet varying geographically and seasonally (Merrick et al. 1997, Loughlin 2002, DoN 2006). For the GOA, foraging habitat is primarily shallow, nearshore and continental shelf waters 8 to 24 km (4.3 to 13 nm) offshore with a secondary occurrence inshore of the 1,000 m isobath, and a rare occurrence seaward of the 1,000 m isobath.

Steller sea lions form large rookeries during late spring when adult males arrive and establish territories (Pitcher and Calkins 1981), so the rookeries would normally be occupied during the likely time-period for the annual Northern Edge exercise.

In 1993, NMFS published a final rule to designate critical habitat for Steller sea lions (NMFS 2008b). There is no Critical Habitat for Steller sea lions in the TMAA. The areas designated as critical habitat were based on land use patterns, the extent of foraging trips, and the availability of prey items with particular importance given to the haul out areas where animals rest, pup, nurse, mate, and molt. Two kinds of marine habitat were designated as critical: "aquatic zones" around rookeries and haulouts and three special aquatic feeding areas in Alaska. The special aquatic foraging areas were chosen, "based on 1) at-sea observations indicating that sea lions commonly used these areas for foraging, 2) records of animals killed incidentally in fisheries in the 1980s, 3) knowledge of sea lion prey and their life histories and distributions, and 4) foraging studies" (NMFS 2008b).

For the eastern DPS, the Critical Habitat aquatic zones (located east of 144°W longitude) extend 3,000 ft (0.9 km) seaward in state and federally managed waters from the baseline or basepoint of each major rookery. None of this Critical Habitat is in the vicinity of the TMAA.

For the western DPS, Critical Habitat for aquatic zones located (west of 144°W longitude) extend 20 nm (37 km) seaward in state and federally managed waters. None of the aquatic zones are located within the boundaries of the TMAA. Steller sea lion foraging in GOA primarily occurs in shallow, nearshore, and continental shelf waters within 4.3 to 13 nm (8 to 24 km) from rookeries and haulouts so the aquatic zone based Critical Habitat in GOA is larger by approximately 7 nm (13 km) than the primary foraging area. Critical Habitat for the western DPS in the vicinity of the TMAA is depicted in Figure 3.8-2 (NMFS 2008b).

Population Size and Trends

The minimum abundance estimate for western DPS Steller sea lions is 38,988 individuals, and the eastern DPS is estimated at 45,095 to 55,832 (Angliss and Allen 2009). Given the wide dispersal of individuals, both the western DPS and eastern DPS may occur in the GOA (DoN 2006, Angliss and Outlaw 2007, NMFS 2008b), with about 70 percent of the population living in Alaskan waters. Between 2000 and 2004, the western DPS increased at a rate of approximately 3 percent per year (Fritz and Stinchcomb 2005). The eastern DPS has increased at an annual rate of approximately 3 percent since at least the late 1970s (Pitcher et al. 2007) and may be a candidate for removal from the list of threatened and endangered species (NMFS 2008b). Despite incomplete surveys conducted in 2006 and 2007, the available data indicate that the western Steller sea lion population (non-pups) was stable since 2004 (when the last complete assessment was done). The revised Steller Sea Lion Recovery Plan (NMFS 2008b) contains recovery criteria to change the listing of the western DPS from endangered to threatened ("down-listing") and to remove it from the list of species requiring ESA protection (delist).

For purposes of acoustic impact modeling, a density of 0.0098/km^2 was derived for Steller sea lions in the TMAA as described in detail in Appendix E.

Distribution

Steller sea lions do not migrate, but they often disperse widely outside of the breeding season (Loughlin 2002). Steller sea lions are gregarious animals that often travel or haul out in large groups of up to 45 individuals (Keple 2002). At sea, groups usually consist of females and subadult males; adult males are usually solitary while at sea (Loughlin 2002). An area of high occurrence extends from the shore to the 273-fathom (500-m) depth. For the GOA, foraging habitat is primarily shallow, nearshore, and continental shelf waters 4.3 to 13 nm (8 to 24 km) offshore with a secondary occurrence inshore of the 3,280 ft (1,000 m) isobath, and a rare occurrence seaward of the 3,280 ft (1,000 m) isobath. Steller sea lions have been sighted foraging in the middle of the GOA (DoN 2006). The April 2009 survey in the TMAA encountered two groups of Steller sea lions (Rone et al. 2009).

Life History

Foraging habitat is primarily shallow, nearshore and continental shelf waters, and some Steller sea lions feed in freshwater rivers (Reeves et al. 1992, Robson 2002). They also are known to feed in deep waters past the continental shelf break (DoN 2006). Haulout and rookery sites are located on isolated islands, rocky shorelines, and jetties. Steller sea lions are opportunistic predators, feeding primarily on fish and cephalopods, and their diet varies geographically and seasonally (Merrick et al. 1997). They feed near land or in relatively shallow water (Pitcher and Calkins 1981).

Steller sea lions form large rookeries during late spring when adult males arrive and establish territories. Large males aggressively defend territories while non-breeding males remain at peripheral sites or haulouts. Females arrive soon after and give birth to pups. Females reach sexual maturity at 4 to 5 years of age (Pitcher and Calkins 1981).

Natural mortality in Steller sea lions is thought to result primarily from killer whale predation, diseases and parasites, and habitat loss (NMFS 2008b). The carrying capacity of the North Pacific for Steller sea lions also likely fluctuates in response to changes in the environment.

Reproduction/Breeding

Most births occur from mid-May through mid-July at rookeries outside the boundaries of the MAA, and breeding takes place shortly thereafter (Pitcher and Calkins 1981). Rookeries of the eastern DPS occur along the coasts of Oregon and California (NMFS 2008b). There are no known areas used by Steller sea lions for reproduction or calving in the TMAA.

Diving Behavior

Details regarding the characterization of diving behavior for input into acoustic impact modeling for Steller sea lions are provided in Appendix D. Diving and foraging activity varies by sex, age, and season. During the breeding season, females with pups feed mostly at night, while territorial males eat little or no food (Loughlin 2002). In the winter, females make long trips of around 81 mi (130 km) and dive deeply to locate prey (Merrick and Loughlin 1997, Loughlin 2002). In the summer, trip length is about 11 mi (17 km) and dives are shallower (Loughlin 2002). Females usually go to sea to feed and return to nurse their pups in 24- to 48-hour cycles (NRC 2003a). Steller sea lions tend to make shallow dives of less than 820 ft (250 m) but are capable of deeper dives (NMFS 2003).

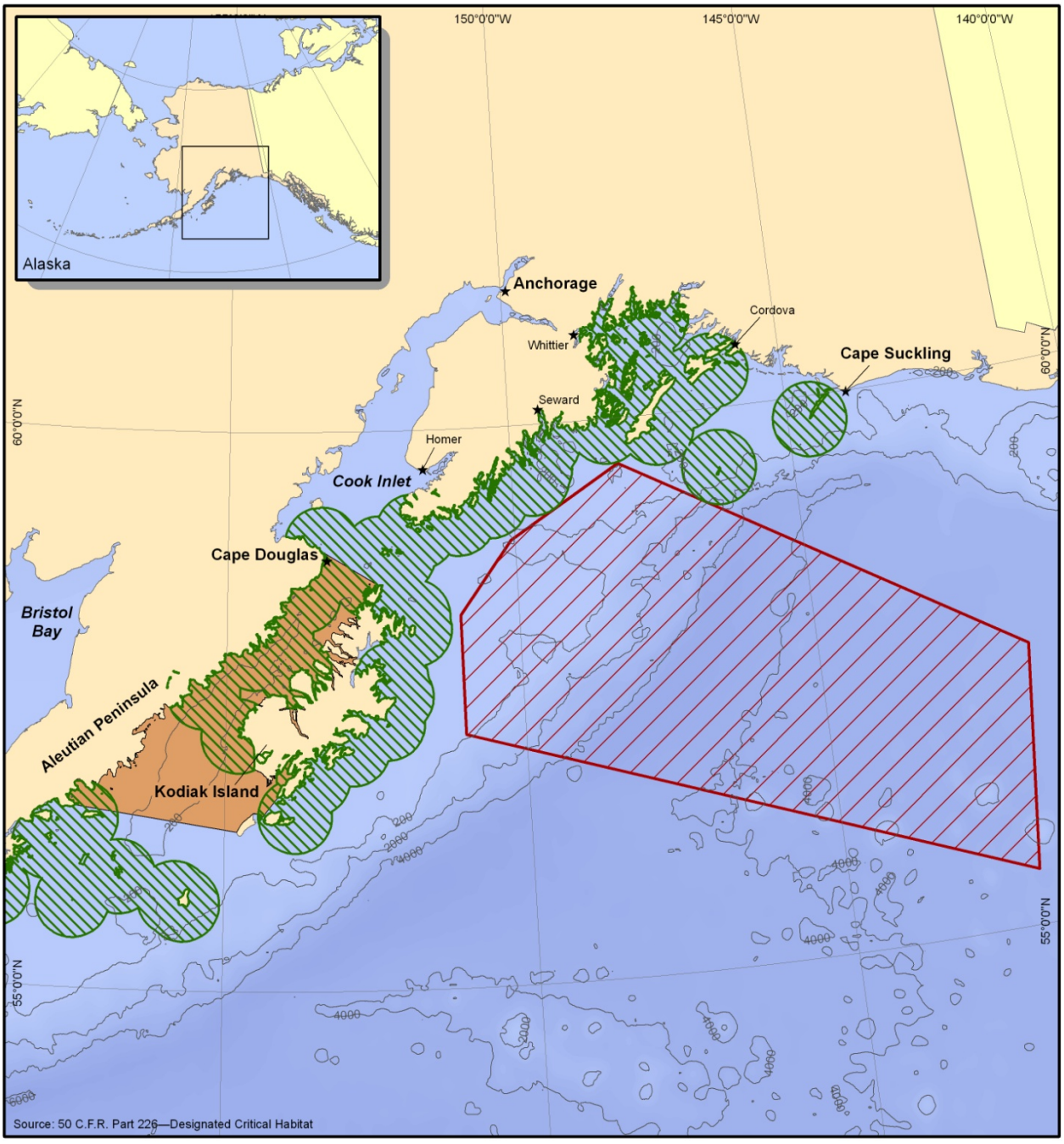


Figure 3.8-2: Steller Sea Lion Western DPS Critical Habitat in the Vicinity of the TMAA

Acoustics

On land, territorial male Steller sea lions usually produce low frequency roars (Schusterman et al. 1970, Loughlin et al. 1987). The calls of females range from 30 Hz to 3 kHz (see Table 3.8-3), with peak frequencies from 150 Hz to 1 kHz; typical duration is 1.0 to 1.5 sec (Campbell et al. 2002). Pups produce bleating sounds. Underwater sounds are similar to those produced on land (Loughlin et al. 1987).

When the underwater hearing sensitivity of two Steller sea lions was tested, the hearing threshold of the male was significantly different from than that of the female. The range of best hearing for the male was from 1 to 16 kHz, with maximum sensitivity (77 dB re 1 µPa @ 1 m) at 1 kHz. The range of best hearing for the female was from 16 kHz to above 25 kHz, with maximum sensitivity (73 dB re 1 µPa @ 1 m) at 25 kHz. However, because of the small number of animals tested, the findings could not be attributed to individual differences in sensitivity or sexual dimorphism (Kastelein et al. 2005).

Impacts of Human Activity

Major sources of induced (anthropogenic) mortality include harvesting by Alaska Natives, fisheries interactions (e.g., entanglements) and food shortages as a result of fishing pressure on prey items, and environmental contamination (NMFS 2008b).

Hunting

Historically, the eastern DPS was subjected to substantial mortality by humans, primarily due to commercial exploitation and both sanctioned and unsanctioned predator control (NMFS 2008b). Alaska Natives are exempted from the MMPA and ESA and continue taking seals for subsistence and/or handicraft purposes. The mean annual harvest of Steller sea lions by Alaska Natives between 2000 and 2004 was estimated approximately 190 animals with the majority of these harvests having involved the western DPS (NMFS 2000). The mean annual take for subsistence harvest between 2002 and 2006 is estimated to have been 198 animals in the western DPS (Angliss and Allen 2009).

State-sanctioned commercial harvest of Steller sea lions ended in 1972 with the advent of the MMPA. Although not well documented, there is little doubt that numbers of Steller sea lions were greatly reduced in many locations by these activities (NMFS 2008b). Commercial hunting and predator control activities have been discontinued and no longer affect the eastern DPS. In contrast to the western DPS, which is experiencing potential human-related threats from competition with fisheries (potentially high), incidental take by fisheries (low), and toxic substances (medium) no threats to continued recovery were identified for the eastern DPS. Although several factors affecting the western DPS also affect the eastern DPS (e.g., environmental variability, killer whale predation, toxic substances, disturbance, shooting), these threats do not appear to be at a level sufficient to keep the eastern DPS from continuing to recover, given the long-term sustained growth of the population as a whole (NMFS 2008b).

Fisheries Interactions

Lethal deterrence of seals from fishing activities ended in 1990 when Steller sea lions were listed under the ESA. Incidental take by fisheries has been assessed as having a low potential threat for the western DPS with an estimated approximate 30 lethal entanglements annually and 3.6 lethal entanglements (estimated in 2005) for the eastern DPS (NMFS 2008b, Angliss and Allen 2009). Entanglement in marine debris is assessed as a minor threat to the Steller sea lions (NMFS 2008b).

Both climate shift and fisheries induced changes in prey communities may have affected the condition of Steller sea lions over the last 40 years, but the relative importance of each is a matter of considerable debate (NMFS 2008b). There are two fishery-related theories about what may have contributed most to decline of Steller sea lions through reductions in prey biomass and quality, which resulted in nutritional stress (proximate cause) and subsequent decreases in vital rates (Trites et al. 2006). In one case,

nutritional stress stems from climate-induced changes in the species composition, distribution or nutritional quality of the sea lion prey base. In the other, fishery-induced reductions in localized or overall prey abundance cause nutritional stress (Braham et al. 1980; NMFS 1998a, 2000).

What may have been unusual about the decline in sea lions observed through 2000 is the introduction of large-scale commercial fisheries on sea lion prey. While large-scale groundfish fisheries began in the 1960s, their potential for competitive overlap with Steller sea lions (e.g., catches within what would be designated as critical habitat) increased markedly in the 1980s. Overall and localized fisheries removals of prey could have exacerbated natural changes in carrying capacity, possibly in nonlinear and unpredictable ways (Goodman et al. 2002). Reductions in carrying capacity may have contributed to declines in Steller sea lion fatality that are believed to have occurred at some rookeries through at least 2002 despite shifts to potentially more favorable environmental conditions that may have occurred in 1989 and 1998 (NMFS 2008b).

3.8.4 Non-ESA Cetacean Species

3.8.4.1 Baird's Beaked Whale

Stock

Alaska

Regulatory Status

Baird's beaked whales (*Berardius bairdii*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The Alaska stock of Baird's beaked whales is not classified as strategic.

Habitat Preferences

Baird's beaked whales appear to occur mainly in cold deep waters (3,300 ft [1,000 m] or greater) over the continental slope, oceanic seamounts, and in areas with submarine escarpments. They may also occur occasionally near shore along narrow continental shelves. The range for the Alaska stock of Baird's beaked whale extends from Cape Navarin (63°N) and the central Sea of Okhotsk (57°N) to St. Matthew Island, the Pribilof Islands in the Bering Sea, and the northern GOA (Angliss and Allen 2009, DoN 2006).

Population Size and Trends

There is no reliable population estimate for the Alaska stock of Baird's beaked whale (Angliss and Allen 2009). For purposes of acoustic impact modeling, a density of 0.0005/km^2 was derived for Baird's beaked whales in the TMAA as described in detail in Appendix E.

Distribution

Baird's beaked whales are found only in the North Pacific and the adjacent seas (Bering Sea, Okhotsk Sea, Sea of Japan, and the Gulf of California), mainly north of 34°N in the west and 28°N in the east. The best-known populations occur in the coastal waters around Japan since whaling takes place there. Along the U.S. west coast, Baird's beaked whales are seen primarily along the continental slope from late spring to early fall. British Columbia whalers commented that Baird's beaked whales were most often sighted during May through September, with most catches occurring during August. Baird's beaked whales are seen less frequently and are presumed to be further offshore during the colder water months of November through April (DoN 2006).

Within the GOA, the area of primary occurrence for Baird's beaked whales during both summer and winter is between the depths of 1,640 and 9,842 ft (500 and 3,000 m). There is no evidence of seasonal movements by this species that would affect these predicted occurrence patterns. There is a secondary

occurrence between the 656 and 1,640 ft (200 and 500 m) isobaths, as well as seaward of the 9,842 ft (3,000 m) isobath. There is a rare occurrence in waters shallower than the 656 ft (200 m) isobath. In 2003, Waite (2003) reported a group of four Baird's beaked whales was sighted at the shelf break to the east of the TMAA. There were no beaked whales detected acoustically or visually (although two groups of unidentified small whale were sighted) during the April 2009 survey of the TMAA (Rone et al. 2009).

Life History

Baird's beaked whales occur in relatively large groups of 6 to 30, and groups of 50 or more sometimes are seen (Balcomb 1989). Baird's beaked whales in Japan prey primarily on deepwater gadiform fishes and cephalopods, indicating that they feed primarily at depths ranging from 800 to 1,200 m (Walker et al. 2002, Ohizumi et al. 2003). Sexual maturity occurs at about 8 to 10 years, and the calving peak is in March and April (Balcomb 1989).

Reproduction/Breeding

Mating generally occurs in October and November but little else is known of their reproductive behavior (Balcomb 1989). There are no known areas used by Baird's beaked whales for reproduction or calving in the TMAA.

Diving Behavior

Details regarding the characterization of diving behavior for input into acoustic impact modeling for Baird's beaked whales is provided in Appendix D. Analysis of stomach contents from captured and stranded individuals suggests that beaked whales are deep-diving animals, feeding by suction (Heyning and Mead 1996). The overall dive behavior of Baird's beaked whales is not known; therefore the diving behavior of a related species, Blainville's beaked whale, is used to provide diving behavior information. Baird et al. (2006) reported on the diving behavior of four Blainville's beaked whales (a similar species) off the west coast of Hawaii. The Blainville's beaked whales foraged in deep ocean areas (2,270-9,855 ft [691-3,003 m]) with a maximum dive to 4,619 ft (1,407 m). Dives ranged from at least 13 min (lost dive recorder during the dive) to a maximum of 68 min (Baird et al. 2006).

Acoustics

Sounds recorded from beaked whales are divided into two categories: whistles and pulsed sounds (clicks), with whistles likely serving a communicative function, and pulsed sounds being important in foraging and/or navigation (Johnson et al. 2004, Madsen et al. 2005, MacLeod and D'Amico 2006). Both whistles and clicks have been recorded from Baird's beaked whales in the eastern north Pacific. Whistles had fundamental frequencies between 4 and 8 kHz, with two to three strong harmonics within the recording bandwidth. Clicks had a dominant frequency around 23 kHz, with a second frequency peak at around 42 kHz (see Table 3.8-3) and, unlike species that echolocate, were most often emitted in irregular series of very few clicks (DoN 2006).

There is no information on the hearing abilities of Baird's beaked whale. In fact, there is no direct information available on the exact hearing abilities of most beaked whales, except for recent information from a live stranded juvenile Gervais' beaked whales (*Mesoplodon europaeus*); another whale in the same taxonomic family. Auditory evoked potential tests on this beaked whale found its hearing to be most sensitive to high-frequency signals between 40 and 80 kHz but it also perceiving mid-frequency sound down to 5 kHz although resulting in smaller evoked potentials (Cook et al. 2006).

It has been previously postulated, based on the occurrence of beaked whale strandings associated with ASW training events, that the species in general may be more sensitive than other cetaceans to sonar (Southall et al. 2007). Recent behavioral response experiments exposing beaked whales to killer whale recordings and sonar sounds in the Bahamas suggested that an anti-predator strategy of flight and fright

may pose a greater risk for stranding than a social defense against predation. These preliminary findings are consistent with conclusions reported by Southall et al. (2007) suggesting that, "beaked whales, like porpoises, may be particularly sensitive to anthropogenic sound, but there is no evidence that they have a special sensitivity to sonar compared with other signals" (Tyack 2009). Beaked whales' reactions to three different sound stimulus in this response study consisted of the animals stopping their clicking, producing fewer foraging buzzes than normal, and ending their dives in a long and unusually slow ascent while moving away from the sound source (Tyack 2009).

Impacts of Human Activity

While beaked whale strandings have been reported since the 1800s, several mass strandings since have been associated with naval operations that may have included mid-frequency sonar (Cox et al. 2006). As Cox et al. (2006) concluded, the state of science can not yet determine if a sound source such as mid-frequency sonar alone causes beaked whale strandings, or if other factors (acoustic, biological, or environmental) must co-occur in conjunction with a sound source. Recent evidence from the experimental sonar exposure to tagged beaked whales seems to suggest there is no general beaked whale sensitivity to Navy sonar (Tyack 2009).

For Alaska waters this is important given that between 27 June and 19 July 2004, five beaked whales were discovered stranded at various locations along 1,600 mi (2,625 km) of the Alaskan coastline and one was found floating (dead) at sea; These whales included three Baird's beaked whales. As described in Appendix F in greater detail, questions were raised soon after the strandings as to whether they were the result of Navy sonar use, although sonar training events had not been part of an exercise which took place in that general timeframe. While records of Baird's beaked whale strandings are uncommon in Alaska waters, they are not unknown. Between 1975 and 1987, eight Baird's beaked whales were found stranded as far north as the area between Cape Pierce and Cape Newenham, to the east near Kodiak, and along the Aleutian Islands (Zimmerman, 1991). In Alaska there has been on average, including more recent data, between zero and three beaked whale strandings documented per year (Jensen 2008).

3.8.4.2 Cuvier's Beaked Whale

Stock

Alaska

Regulatory Status

Cuvier's beaked whales (*Ziphius cavirostris*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The Alaska stock of Cuvier's beaked whales is not classified as strategic.

Habitat Preferences

World-wide, beaked whales normally inhabit continental slope (656-6,562 ft [200-2,000 m]) and deep oceanic waters (>6,562 ft [>2,000 m]), and only rarely stray over the continental shelf (Pitman 2002). Beaked whales are only occasionally reported in waters over the continental shelf. Cuvier's beaked whales generally are sighted in waters with a bottom depth greater than 656 ft (200 m) and are frequently recorded at depths of 3,280 ft (1,000 m) or more. Forney and Brownell (1996) made one sighting of Cuvier's beaked whales during surveys in the Aleutian Islands during 1994 in waters with a bottom depth of 13,123 to 16,404 ft (4,000 to 5,000 m). Rice and Wolman (1982) observed a group of six Cuvier's beaked whales in about 17,716 ft (5,400 m) of water southeast of Kodiak Island. Waite (2003) reported one sighting of a group of four Cuvier's beaked whales at the shelf break within the TMAA. There were no beaked whales detected acoustically or visually (although two groups of unidentified small whale were sighted) during the April 2009 survey of the TMAA (Rone et al. 2009).

Population Size and Trends

There is no population estimate for the Alaska stock of Cuvier's beaked whales (Angliss and Allen 2009). For purposes of acoustic impact modeling, a density of 0.0022/km^2 was derived for Cuvier's beaked whales in the TMAA as described in detail in Appendix E.

Distribution

The general distribution of Cuvier's beaked whales is primarily derived from strandings, which indicated that they are the most widely distributed of the beaked whales. They occur in all three major oceans and most seas. In the north Pacific, they range north to the northern GOA, the Aleutian Islands, and the Commander Islands and as far south as Hawaii. Cuvier's beaked whales generally are sighted in waters with a bottom depth greater than 656 ft (200 m) and are frequently recorded in areas with depths of 3,281 ft (1,000 m) or more. Occurrence has been linked to physical features such as the continental slope, canyons, escarpments, and oceanic islands (Angliss and Outlaw 2005).

Life History

Little is known of the feeding preferences of Cuvier's beaked whale. They may be mid-water and bottom feeders (Baird et al. 2005b) on cephalopods and, rarely, fish (MacLeod et al. 2003).

Reproduction/Breeding

Little is known of Cuvier's beaked whale reproductive behavior. There are no known areas used by Cuvier's beaked whales for reproduction or calving in the TMAA.

Diving Behavior

Recent research has provided considerable information regarding the complex patterns associated with the diving behavior of this species. Details regarding dive behavior information and how it was used in deriving parameters for input to the acoustic modeling are provided in Appendix D. In general, Cuvier's beaked whales feed on deep sea fish and squid and tend to dive for an hour or more to considerable depths to forage. Tagged Cuvier's beaked whale dive durations have been recorded for as long as 87 min and dive depths of up to 6,529 ft (1,990 m) (Baird et al. 2006).

Acoustics

MacLeod (1999) suggested that beaked whales use frequencies of between 300 Hz and 129 kHz for echolocation, and between 2 and 10 kHz, and possibly up to 16 kHz, for social communication. Blainville's beaked whales echolocation clicks were recorded at frequencies from 20 to 40 kHz (Johnson et al. 2004) and Cuvier's beaked whales at frequencies from 20 to 70 kHz (Zimmer et al. 2005). Soto et al. (2006) reported changes in vocalizations during diving on close approaches of large cargo ships which may have masked their vocalizations. Cuvier's beaked whales only echolocated below 200 m (656 ft) (Tyack et al. 2006). Echolocation clicks are produced in trains (interclick intervals near 0.4 second) and individual clicks are frequency modulated pulses with durations of 200-300 microsecond; the center frequency was around 40 kHz with no energy below 20 kHz (Tyack et al. 2006).

Impacts of Human Activity

Fisheries Interactions

From 1990 to 2002, six different commercial fisheries operating within the range of the Alaska stock of Cuvier's beaked whales were monitored for incidental take. These fisheries included Bering Sea (and Aleutian Islands) ground fish trawl, longline, and pot fisheries and GOA ground fish trawl, longline, and pot fisheries. No Cuvier's beaked whale mortalities were observed (Angliss and Outlaw 2007).

Strandings

As noted previously for Baird's beaked whales, mass strandings associated with naval training that may have included mid-frequency sonar is a concern for all beaked whales. Between 27 June and 19 July 2004, five beaked whales were discovered stranded at various locations along 1,600 mi (2,575 km) of the Alaskan coastline and one was found floating (dead) at sea. These whales included two Cuvier's beaked whales. As described in Appendix F in greater detail, these strandings were not associated with sonar use by the Navy. Additionally, prior to the Navy conducting the exercise (before 27 June), two Cuvier's beaked whales were discovered stranded at two separate locations along the Alaskan coastline (February 26 at Yakutat and June 1 at Nuka Bay).

Zimmerman (1991) reported that between 1975 and 1987, 19 Cuvier's beaked whales were found stranded from the eastern GOA to the western Aleutians. As noted previously, on average in Alaska there has been on average between zero and three beaked whale strandings documented per year (Jensen 2008).

3.8.4.3 Dall's Porpoise

Stock

Alaska

Regulatory Status

Dall's porpoises (*Phocoenoides dalli*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The Alaska stock of Dall's porpoise is not classified as strategic.

Habitat Preferences

Dall's porpoises are a cool- temperate to subarctic deepwater species found only in the North Pacific and adjacent seas. Cool water temperature (<63 degrees Fahrenheit [°F], 17 degrees Celsius [°C]) is characteristic of their primary habitat. Dall's porpoises are common along the shelf break, slope, and in offshore waters (Consiglieri et al. 1982, Calkins 1986). The waters of the TMAA are an area of primary occurrence.

Population Size and Trends

Numerous studies have documented the occurrence of Dall's porpoises in the Aleutian Islands and western GOA as well as in the Bering Sea. Using a population estimate based on vessel surveys during 1987–1991, and correcting for the tendency of this species to approach vessels, which has been suggested to result in inflated abundance estimates, perhaps by as much as five times, reported a minimum population estimate of 83,400 (CV=0.097) for the Alaska stock of Dall's porpoise. (Angliss and Outlaw 2008) Based on the derived density of 0.1892/km^2 for acoustic impact modeling (Appendix E), Dall's porpoises are the most common cetacean in the TMAA.

Distribution

Dall's porpoises are found from northern Baja California, Mexico, north to the northern Bering Sea and south to southern Japan (Jefferson et al. 1993). The species is only common between 32°N and 62°N in the eastern north Pacific (Morejohn 1979; Houck and Jefferson 1999). Dall's porpoises shift their distribution southward during cooler-water periods (Forney and Barlow 1998). Norris and Prescott (1961) reported finding Dall's porpoises in southern California waters only in the winter, generally when the water temperature was less than 59°F (15°C). Inshore/offshore movements off southern California have also been reported, with individuals remaining inshore in fall and moving offshore in the late spring (Norris and Prescott 1961, Houck and Jefferson 1999, Lagomarsino and Price 2001). Seasonal

movements have also been noted off Oregon and Washington, where higher densities of Dall's porpoises were sighted offshore in winter and spring and inshore in summer and fall (Green et al. 1992).

Fiscus et al. (1976) suggested that Dall's porpoise is probably the most common cetacean from the northeast GOA to Kodiak Island. Dall's porpoises are regularly found throughout the GOA year-round. Sightings indicate a general seasonal shift in distribution in the GOA from east in April to west in May and south in June. Dall's porpoises are common along the shelf break, slope, and in offshore waters. Dall's porpoises are primarily found seaward of the 328 ft (100 m) isobaths in the GOA throughout the year. (Angliss and Outlaw 2008, DoN 2006). The April 2009 survey in the TMAA encountered 10 groups of Dall's porpoise totaling 59 individuals in both inshore and offshore strata (Rone et al. 2009).

Life History

Dall's porpoises feed primarily on small fish and squid (Houck and Jefferson 1999). Groups of Dall's porpoises generally include fewer than 10 individuals and are fluid, probably aggregating for feeding (Jefferson 1990, 1991; Houck and Jefferson 1999). There is a strong summer calving peak from June through August, and a smaller peak in March (Jefferson 1989). Animals reach sexual maturity at 3.5 to 8 years (Houck and Jefferson 1999).

Reproduction/Breeding

Calving for Dall's porpoise occurs in the north Pacific from early June through late July (Ferrero and Walker 1999). There are no known areas used by Dall's porpoise for reproduction or calving in the TMAA.

Diving Behavior

Details regarding the characterization of diving behavior for input into acoustic impact modeling for Dall's porpoises are provided in Appendix D. Dall's porpoises feed on small fish and squid. In the GOA, Dall's porpoises primarily feed on lanternfish (myctophids). Hanson and Baird (1998) provided the first data on diving behavior for this species: an individual tagged for 41 min dove to a mean depth of 109.6 ft (33.4 m; Standard Deviation [S.D.] = ±23.9 m) for a mean duration of 1.29 min (S.D. = ±0.84 min). (DoN 2006)

Acoustics

Only short-duration pulsed sounds have been recorded from Dall's porpoises; this species apparently does not whistle often. Dall's porpoises produce short-duration (50 to 1,500 microsecond [µs]), high-frequency, narrow-band clicks, with peak energies between 120 and 160 kHz. There are no published data on hearing abilities of this species. However, based on the morphology of the cochlea, it is estimated that the upper hearing threshold is about 170 to 200 kHz (see Table 3.8-3). (DoN 2006)

Impacts of Human Activity

Fisheries Interactions

The Alaska Peninsula and Aleutian Island salmon driftnet fishery was monitored in 1990. One Dall's porpoise mortality was observed which extrapolated to an annual (total) incidental mortality rate of 28 Dall's porpoise. In addition, over a 5-year period (2000-2004), observations of the Bering Sea/Aleutian Islands pollock trawl fishery resulted in a mean annual mortality of 5.9 Dall's porpoises. This results in an estimated annual incidental kill rate in observed fisheries of 33.9 Dall's porpoises per year for the Alaska stock. (Angliss and Outlaw 2008)

3.8.4.4 Gray Whale

Stock

Eastern North Pacific

Regulatory Status

The ENP stock of gray whales was delisted given an increase in population so it was no longer considered "endangered" or "threatened" under the ESA. Subsequent review determined that the stock was neither in danger of extinction, nor likely to become endangered within the foreseeable future. The ENP stock is not classified as a "strategic" stock by NMFS. (Angliss and Allen 2009)

Habitat Preferences

Gray whales primarily occur in shallow waters over the continental shelf. Their feeding grounds are generally less than 223 ft (68 m) deep and most of the ENP stock can be found in summer feeding grounds north of the Aleutian Islands. During migration through the GOA en route from subtropical breeding grounds, gray whales' primary occurrence extends seaward 15 nm (28 km) from the shoreline within a narrow margin of the TMAA's northern boundary. A rare occurrence is expected seaward of the shelf break. (DoN 2006)

Population Size and Trends

Systematic counts of gray whales migrating south along the central California coast have been conducted most years since 1967, documenting the population increasing over the past several decades. The minimum population estimates for the ENP stock of gray whales using the mean of the 2000/01 and 2001/02 abundance estimates is 17,752 and the best estimate of 18,813 whales (CV = 0.07; Angliss and Allen 2009). For purposes of acoustic impact modeling, a density was estimated at 0.0125/km^2, and is applicable only for the farthest north area of the TMAA (2.75 percent of the area) as described in detail in Appendix E.

Distribution

Gray whales are found only in the North Pacific. The ENP population is found from the upper Gulf of California, south to the tip of Baja California, and up the Pacific coast of North America to the Chukchi and Beaufort seas. This stock is known to summer in the shallow waters of the northern Bering Sea, Chukchi Sea, and western Beaufort Sea, but some individuals spend the summer feeding along the Pacific coast from southeastern Alaska to central California. Beginning in October, the whales migrate south to calving and breeding grounds on the west coast of Baja California and the southeastern Gulf of California. Some gray whales are known to deviate from the typical migration path/seasons; for example, gray whale calls have been documented off Barrow, Alaska, in the winter. (DoN 2006, Angliss and Allen 2009)

Gray whales are found along the shore in the northern GOA during migrations between breeding and feeding grounds. Individuals are expected to occur along the northern coast of the GOA between March and November; peak abundance is expected from April through May and in November and December. The southbound migration begins in early October, when gray whales move from the Bering Sea through the Unimak Pass and along the coast of the GOA. The southbound migration continues into the winter season between October and January. Migration of gray whales past Kodiak Island peaks in mid-December. During the northbound migration, the peak of migration in the GOA is in mid-April. Although most gray whales migrate to the Bering Sea to feed, some whales do not complete the migration north but feed in coastal waters in the GOA and the Pacific Northwest. (DoN 2006)

Most gray whales follow the coast during migration and stay within 1.2 mi (2 km) of the shoreline, except when crossing major bays, straits, and inlets from southeastern Alaska to the eastern Bering Sea. However, gray whales are known to move further offshore between the entrance to Prince William Sound and Kodiak Island and between Kodiak Island and the southern part of the Alaska Peninsula. Gray whales use the nearshore areas of the Alaska Peninsula during the spring and fall migrations and are often found within the bays and lagoons, primarily north of the peninsula, during the summer (DoN 2006). The April 2009 survey encountered one group of two gray whales within the western edge of the TMAA and two groups well outside the TMAA nearshore at Kodiak Island (Rone et al. 2009).

Life History

Most of the gray whales in the Eastern North Pacific stock spend the summer feeding in the northern Bering and Chukchi Seas. However, gray whales have been seen feeding in the summer off of Southeast Alaska, British Columbia, Washington, Oregon, and California. Each fall, the whales migrate south from Alaska to Baja California, in Mexico. The stock winters primarily in certain shallow, nearly landlocked lagoons and bays along the west coast of Baja California. Calves are born from early January to mid-February. The northbound migration begins in mid-February and continues through May, with cows and newborn calves migrating northward primarily between March and June along the U.S. west coast. (Angliss and Outlaw 2007)

Reproduction/Breeding

The winter breeding grounds consist of subtropical lagoons that are protected from the open ocean (Jones and Swartz 2002). There are no known areas used by gray whales for reproduction or calving in the TMAA.

Diving Behavior

Details regarding the characterization of diving behavior for input into acoustic impact modeling for gray whales are provided in Appendix D. When foraging, gray whales typically dive to 164 to 196 ft (50 to 60 m) for 5 min to about 8 min. When migrating, gray whales may remain submerged near the surface for 7 to 10 min and travel 1,640 ft (500 m) or more before resurfacing to breathe. Migrating gray whales sometimes exhibit a unique "snorkeling" behavior in which they surface cautiously, exposing only the area around the blow hole, exhale quietly without a visible blow, and sink silently beneath the surface. The maximum known dive depth is 557 ft (170 m) (DoN 2006, Jones and Swartz 2002).

Acoustics

Gray whales produce broadband signals ranging from 0.1 to 4 kHz (and up to 12 kHz). The most common sounds on the breeding and feeding grounds are knocks, which are broadband pulses from about 0.1 to 2 kHz (dominant frequency range: 0.327 to 0.825 kHz; see Table 3.8-3). The source level for knocks is approximately 142 dB re 1 µPa @ 1 m. During migration, individuals most often produce low-frequency (predominantly below 1.5 kHz) bonging sounds and moans. (DoN 2006)

The structure of the gray whale ear is evolved for low-frequency hearing. The ability of gray whales to hear frequencies below 2 kHz (as low as 0.8 kHz) has been demonstrated in playback studies and in their responsiveness to underwater noise associated with oil and gas activities. Gray whale responses to noise in these studies include startle responses (i.e., water disturbances, tail-lobbing); changes in swimming speed and direction to move away from the sound source; abrupt behavioral changes from feeding to avoidance, with a resumption of feeding after exposure; changes in calling rates and call structure; and changes in surface behavior, usually from traveling to milling. It was determined the threshold for inducing feeding interruptions from air gun noise was a received level of 173 dB re 1 ìPa @ 1 m, and for

continuous industrial noise, the threshold for inducing avoidance was a received level of approximately 120 dB re 1 ìPa @ 1 m. (DoN 2006)

Impacts of Human Activity

Subsistence Interactions

Subsistence hunters in Alaska and Russia have traditionally harvested whales from the ENP stock of gray whales. Based upon reported taking of whales by subsistence hunters from 1995 to 1997 along with an agreement reached between the United States and Russia that the average annual harvest of gray whales would be 124, the annual subsistence take of gray whales averaged 122 whales during a 5-year period from 1999 to 2003. (Angliss and Allen 2009)

Vessel Collisions

The nearshore migration route used by gray whales makes ships strike a potential source of mortality. Between 1999 and 2003, the California stranding network reported four serious injuries or mortalities of gray whales caused by ship strikes. One ship strike was reported in Alaska in 1997. Additional mortality from ship strikes probably goes unreported because the whales either do not strand or do not have obvious signs of trauma. (Angliss and Allen 2009)

3.8.4.5 Harbor Porpoise

Stock

Gulf of Alaska

Regulatory Status

Harbor porpoise (*Phocoena phocoena*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The Gulf of Alaska stock of harbor porpoise is classified as strategic.

Habitat Preferences

Harbor porpoises are generally found in cool temperate to subarctic waters over the continental shelf. This species is seldom found in waters warmer than 62°F (17°C). In Alaskan waters, harbor porpoises inhabit nearshore areas and are common in bays, estuaries, and tidal channels. Harbor porpoises are often found in coastal waters and in the GOA and Southeast Alaska; they occur most frequently in waters less than 328 ft (100 m) in depth. (DoN 2006, Angliss and Allen 2009) Waite (2003) reports a single sighting (two individuals) 27 nm (50 km) offshore, but within the 328 ft (100 m) isobath. The majority of the TMAA is well offshore of the normal habitat range for harbor porpoise. The April 2009 survey encountered 30 groups of harbor porpoise totaling 89 individuals but only one of these groups was located within the TMAA (Rone et al. 2009).

Population Size and Trends

Two of the nine stocks of harbor porpoises recognized along the U.S. Pacific coast are found near the TMAA: the Gulf of Alaska, and Southeast Alaska stocks. The boundaries of the Gulf of Alaska stock are Cape Suckling to Unimak Pass in the Aleutian Islands. The boundaries of the Southeast Alaska stock are northern border of British Columbia to Cape Suckling, Alaska (Angliss and Outlaw 2008). Given the distance from shore and the depth of the waters, individuals from the Southeast Alaska stock should not be present in the TMAA. Individuals from the Gulf of Alaska stock may rarely occur in the northern portion of the TMAA. There is a minimum population estimate of 41,854 for the Gulf of Alaska stock. There are not sufficient numbers of harbor porpoise present in the TMAA to allow for acoustic impact modeling given they are rare.

To derive an estimate for the number of harbor porpoise that may be exposed to potential MMPA Level B harassment (behavioral disturbance), an analysis of the approximate distribution of harbor porpoise in the Gulf of Alaska stock (occurring from Unimak Pass to Cape Suckling as presented in the stock assessment; Angliss and Outlaw 2006) was undertaken as a first step. The stock assessment information indicates an area for the GOA stock of approximately 69,829 nm^2 (239,597 km^2) with an abundance of 41,854 animals, resulting in the second highest density for a marine mammal species in the GOA (0.5993/nm^2 or 0.1747/km^2). The nearshore portion of the TMAA overlaps this approximate distribution by an area of 4,538 nm^2 (15,565 km^2). If an even distribution of harbor porpoise in the Gulf of Alaska stock is assumed, there would be 2,719 harbor porpoise in the portion of the TMAA that overlaps the distribution as presented in the stock assessment. While this is likely an overestimate for the number of animals present in the area given the TMAA is outside harbor porpoise habitat preferences, it will be assumed for purposes of this analysis that 2,719 harbor porpoise would be exposed to a sound level at or above 120 dB Sound Pressure Level (SPL) resulting in MMPA Level B behavioral harassment during one summer training event.

Distribution

Harbor porpoises are generally found in cool temperate to subarctic waters over the continental shelf in both the North Atlantic and North Pacific. Harbor porpoises regularly occur in the GOA year-round. They are common in nearshore waters of the northeast GOA and south of Kodiak Island on Albatross and Portlock banks. They also regularly occur in Kachemak Bay, Prince William Sound, Yakutat Bay, and southeast Alaska, particularly between April and September. Based on aerial surveys in coastal and offshore waters from Bristol Bay (eastern Bering Sea) to Dixon Entrance (southeast Alaska), harbor porpoises are abundant in Bristol Bay and between Prince William Sound and Dixon Entrance. Lower abundance estimates were calculated for Cook Inlet, Kodiak Island, and the south side of the Alaska Peninsula. (DoN 2006, Angliss and Allen 2009)

Life History

Harbor porpoises are not known to form stable social groupings, which is the typical situation for species in the porpoise family. In most areas, harbor porpoises are found in small groups consisting of just a few individuals. (DoN 2006)

Reproduction/Breeding

They mature at an earlier age, reproduce more frequently, and live for shorter periods than other toothed whales (Read and Hohn 1995). Calves are born in late spring (Read 1990, Read and Hohn 1995). Dall's and harbor porpoises appear to hybridize relatively frequently in the Puget Sound area (Willis et al. 2004). There are no known areas used by Harbor porpoises for reproduction or calving in the TMAA.

Diving Behavior

Harbor porpoises make brief dives, generally lasting less than 5 min. Tagged harbor porpoise individuals spend 3 to 7 percent of their time at the surface and 33 to 60 percent in the upper 7 ft (2 m) of the water column. Average dive depths range from 46 to 135 ft (14 to 41 m), with a maximum known dive of 741 ft (226 m), and average dive durations ranging from 44 to 103 sec. (DoN 2006)

Acoustics

Harbor porpoise vocalizations include clicks and pulses, as well as whistle-like signals. The dominant frequency range is 110 to 150 kHz, with source levels of 135 to 177 dB re 1 µPa @ 1 m. Echolocation signals include one or two low-frequency components in the 1.4 to 2.5 kHz range. (DoN 2006)

A behavioral audiogram of a harbor porpoise indicated the range of best sensitivity is 8 to 32 kHz at levels between 45 and 50 dB re 1 µPa @ 1 m; however, auditory-evoked potential studies showed a much higher frequency of approximately 125 to 130 kHz with two frequency ranges of best sensitivity. More recent psycho-acoustic studies found the range of best hearing to be 16 to 140 kHz (see Table 3.8-3), with a reduced sensitivity around 64 kHz and maximum sensitivity between 100 and 140 kHz. (DoN 2006)

Impacts of Human Activity

Fisheries Interactions

The Pacific cod longline, Pacific halibut longline, rockfish longline, and sablefish longline fisheries were monitored for incidental mortality by fishery observers from 2000 to 2004. No mortalities were observed for the Southeast Alaska or Gulf of Alaska stock of the harbor porpoise. However, monitoring in Prince William Sound (1990-1991), Cook Inlet (1999 and 2000), and Kodiak Island (2002) of salmon drift and set gillnet fisheries resulted in the observation of incidental mortalities. These mortalities extrapolated to an estimated mortality level of 71 animals per year for the Gulf of Alaska stock of harbor porpoise.

3.8.4.6 Killer Whale

There are at least three killer whale (*Orcinus orca*) ecotypes in the eastern north Pacific: "residents," "transients," and "offshore" killer whales. Resident animals often differ from both transient and offshore individuals by having a dorsal fin that is more curved and rounded at the tip, especially among mature females. Residents also exhibit five patterns of saddle patch pigmentation, two of which are shared with transients. Transients have more pointed dorsal fins, and closed saddle patches that extend further forward. Offshores are thought to be slightly smaller in body size than residents and transients and have dorsal fins and saddle patches resembling those of residents. (DoN 2006)

Stock

Eastern North Pacific Alaska Resident, Eastern North Pacific Northern Resident, Eastern North Pacific Offshore, Gulf of Alaska, Aleutian Island, and Bering Sea Transient, AT1 Transient; and West Coast Transient

Regulatory Status

The ENP Alaska Resident, ENP Northern Resident, ENP Offshore, GOA, Aleutian Islands, and Bering Sea transient, and West Coast Transient stocks of killer whales are not listed as threatened or endangered under the ESA or classified as depleted or strategic under the MMPA. In June 2004, NMFS designated the AT1 Transient stock of killer whales as a "depleted" stock under the MMPA and therefore classified as strategic. (Angliss and Allen 2009). In the past, the AT1 Transient stock was one of the most frequently encountered and was sighted year-round in Prince William Sound in the 1980s. However, since the 1989 Exxon Valdez oil spill, the size of the AT1 Transient stock has been reduced by half. The AT1 Transient stock is not currently listed as threatened or endangered.

Habitat Preferences

Killer whales have the most ubiquitous distribution of any species of marine mammal, observed in virtually every marine habitat from the tropics to the poles and from shallow, inshore waters (and even rivers) to deep, oceanic regions. Although reported in tropical and offshore waters, killer whales occur in higher densities in colder and more productive waters of both hemispheres, with the greatest densities found at high latitudes. In the eastern north Pacific, including Alaskan waters, killer whales are found in protected inshore waters, as well as offshore waters. (DoN 2006)

Population Size and Trends

Killer whales are segregated socially, genetically, and ecologically into three distinct eco-type groups: residents, transients, and offshore animals. Resident killer whales primarily feed on fish. "Transient" stocks of killer whales feed on other marine mammals, including other whales, pinnipeds (e.g., London 2006) and sea otters (e.g., Estes et al. 1998) and do not have known schedules and locations as resident whales do. Offshore whales do not appear to mix with the other types of killer whales (Black et al. 1997, Dahlheim et al. 1997). Most cetacean taxonomists agree that multiple killer whale species or subspecies occur worldwide (DoN 2006).

ENP Alaskan Resident stock individuals are found from southeastern Alaska to the Aleutian Islands and Bering Sea; intermixing has been documented among these three areas (Angliss and Outlaw 2007). The ENP Northern Resident stock occurs from British Columbia through part of southeastern Alaska. There are about 656 and 216 photoidentified individuals in the ENP Alaska Resident and ENP Northern Resident stocks, respectively (Angliss and Allen 2009).

The minimum population estimate for the Gulf of Alaska, Aleutian Islands, and Bering Sea Transient stock is 314 individuals based on photoidentification work. There is a minimum population estimate of 320 individuals in the West Coast Transient stock including about 225 in Washington State and British Columbia, and southeastern Alaska, and 105 off California. The population estimate for the ENP Stock of transient killer whales is 346. The minimum population estimate for the AT1 Transient stock is seven individuals based on photographs from recent years. (Angliss and Allen 2009)

The minimum population estimate for the ENP Offshore stock of killer whales is 1,214 individuals (Carretta et al. 2007). The total number of known Offshore killer whales is 211 individuals, but the proportion of time this transboundary stock spends in U.S. waters is unknown (Carretta et al. 2006). For purposes of acoustic impact modeling, a density of 0.010/km^2 was derived as representative for all killer whales in the TMAA as described in detail in Appendix E.

Distribution

Movement data on ENP Alaska Resident stock individuals have been documented based on photographic matches. Southeast Alaskan killer whale pods have been seen in Prince William Sound and in the GOA. Prince William Sound pods have been seen near Kodiak Island, but have never been observed in southeastern Alaska. Recent studies have documented very limited movements between the Bering Sea and GOA. (Angliss and Allen 2009, DoN 2006)

Transient killer whales in the eastern north Pacific spend most of their time along the outer coast, but visit Hood Canal and Puget Sound in search of harbor seals, sea lions, and other prey. Transient occurrence in inland waters appears to peak during August and September, which is the peak time for harbor seal pupping, weaning, and post-weaning. Offshore killer whales usually occur 9 mi (15 km) or more offshore but also visit coastal waters and occasionally enter protected inshore waters. Along the Pacific coast of North America, killer whales are found along the entire Alaskan coast, and are seen frequently in southeast Alaska and the area between Prince William Sound and Kodiak Island. (Angliss and Allen 2009; DoN 2006)

GOA, Aleutian Islands, and Bering Sea transients are seen throughout the GOA, including occasional sightings in Prince William Sound. Wade et al. (2003) noted that transients were more frequently seen from Shumagin Islands to the eastern Aleutian Islands. The AT1 Transient stock is primarily seen in Prince William Sound and in the Kenai Fjords region. At present, there is no information available to determine if this group regularly uses the TMAA. West coast transients are found from California to

northern southeast Alaska. Some individual killer whales have been documented to move between the waters of southeast Alaska and central California. (Angliss and Allen 2009, DoN 2006)

The known range of the ENP Northern Resident stock includes Canadian waters from approximately Mid-Vancouver Island and throughout most of southeastern Alaskan waters. They have also been frequently seen in Washington state waters. (Angliss and Allen 2009, DoN 2006)

In Alaska, sightings of killer whales are widely distributed, mostly occurring in waters over the continental shelf, but also quite frequently in offshore waters. The Resident population is suspected to pass through the TMAA regularly during the summer based on limited satellite tagging data. The sympatric Gulf of Alaska, Aleutian Island, and Bering Sea transient population is suspected to spend considerable time in offshore waters, due to the infrequency of nearshore sightings; however, it is not certain how much time these killer whales spend in the TMAA. Members of the Offshore population have been seen only irregularly adjacent to the TMAA, and although it is likely they pass through it there is not data to document this. (Angliss and Allen 2009, DoN 2006)

There is no known seasonal component to the killer whale's occurrence in the TMAA. Resident, AT1 transient, and Gulf of Alaska, Aleutian Island, and Bering Sea transient populations all remain in the general area during the winter, however, there is no data that specifically places these whales in the TMAA due to lack of substantial research effort offshore and in winter. (Angliss and Allen 2009, DoN 2006)

The April 2009 GOALS survey visually detected six groups of killer whales totaling 119 individuals within the TMAA although there were additional acoustic detections as well (Rone et al. 2009). Analysis of photos taken for identification has not yet been completed and, at present, the specific eco-types for some of these detected killer whales have not been determined.

Life History

Diet in the eastern North Pacific is specific to the type of killer whale. The offshore ecotype appears to eat mostly fish (Bigg 1982, Morton 1990, Heise et al. 2003, Herman et al. 2005). Few details are known about the biology of offshore killer whales, but they commonly occur in groups of 20 to 75 individuals (Wiles 2004).

Transient killer whales show greater variability in habitat use, with some groups spending most of their time foraging in shallow waters close to shore while others hunt almost entirely in open water (Heimlich-Boran 1988, Felleman et al. 1991, Baird and Dill 1995, Matkin and Saulitis 1997). Transient killer whales feed on marine mammals and some seabirds, but apparently no fish (Morton 1990, Baird and Dill 1996, Ford et al. 1998, Ford and Ellis 1999, Ford et al. 2005). Transient killer whales travel in small, matrilineal groups, but they typically contain fewer than 10 animals and their social organization generally is more flexible than in residents (Morton 1990, Ford and Ellis 1999). These differences in social organization probably relate to differences in foraging (Baird and Whitehead 2000).

Reproduction/Breeding

There is no information on the reproductive behavior of killer whales in this area. Among resident killer whales in the northeastern Pacific, births occur largely from October to March, although births can occur year-round (Olesiuk et al. 1990, Stacey and Baird 1997).

While there is a lack of data on the reproduction/breeding activities of transient killer whales, it is thought that calving occurs year-round, but tends to peak in fall through spring. (Angliss and Outlaw 2007) There are no known areas used by killer whales for reproduction or calving in the TMAA.

Diving Behavior

The maximum depth recorded for free-ranging killer whales diving off British Columbia is 866 ft (264 m) (Baird et al. 2005a). On average, however, for seven tagged individuals, less than one percent of all dives examined were to depths greater than 98 ft (30 m). A trained killer whale dove to a maximum of 853 ft (260 m) (Baird et al. 2003). The longest duration of a recorded dive from a radio-tagged killer whale was 17 min (DoN 2006). Details regarding the diving behavior as characterized for acoustic modeling input are provided in Appendix D.

Acoustics

Killer whales produce a wide-variety of clicks and whistles, but most of this species' social sounds are pulsed, with frequencies ranging from 0.5 to 25 kHz (dominant frequency range: 1 to 6 kHz). Echolocation clicks recorded for this species indicate source levels ranging from 195 to 224 dB re: 1 ìPa @ 1 m peak-to-peak (see Table 3.8-3), dominant frequencies ranging from 20 to 60 kHz, and durations of 80 to 120 microseconds (ìsec). Source levels associated with social sounds have been calculated to range from 131 to 168 dB re 1 ìPa @ 1 m and have been demonstrated to vary with vocalization type (e.g., whistles: average source level of 140.2 dB re 1 ìPa @ 1 m, variable calls: average source level of 146.6 dB re 1 ìPa @ 1 m, and stereotyped calls: average source level 152.6 dB re 1 ìPa @ 1 m). Additionally, killer whales modify their vocalizations depending on social context or ecological function (i.e., short-range vocalizations [<5.4 nm {10 km} range]) are typically associated with social and resting behaviors and long-range vocalizations [5.4 to 8.6 nm {10 to 16 km} range] associated with travel and foraging). (DoN 2006)

Resident killer whales are very vocal, making calls during all types of behavioral states. Acoustic studies of resident killer whales in the Pacific Northwest have found that there are dialects in their highly stereotyped, repetitive discrete calls, which are group-specific and shared by all group members. These dialects likely are used to maintain group identity and cohesion, and may serve as indicators of relatedness that help in the avoidance of inbreeding between closely related whales. Dialects have been documented in northern Norway and southern Alaskan killer whale populations and are likely to occur in other regions as well. Residents do not need to alter their sounds (i.e., frequency or amplitude) when hunting fishes, since most of their prey (i.e., salmonids) are not capable of hearing in this frequency range (i.e., >20 kHz).

Transient killer whales, conversely, appear to use passive listening as a primary means of locating prey, call less often, and frequently vocalize or use high-amplitude vocalizations only when socializing (i.e., not hunting), trying to communicate over long distances, or after a successful attack, as a result of their prey's ability (i.e., primarily other marine mammal species) to hear or "eavesdrop" on their sounds. Discrete pulsed calls were recently identified in the vocal repertoire of the AT1 transients and for transients off southern Alaska, indicating that transients may maintain reproductive and socially isolated subpopulations using distinct vocalizations as well. (DoN 2006)

Both behavioral and auditory brainstem response (ABR) techniques indicate killer whales can hear a frequency range of 1 to 100 kHz and are most sensitive at 20 kHz, which is one the lowest maximum-sensitivity frequency known among toothed whales (DoN 2006).

Impacts of Human Activity

Fisheries Interactions

Three commercial fisheries in Alaska have caused serious injuries or mortalities of killer whales (any stock) between 2000 and 2004: the Bering Sea and Aleutian Islands flatfish trawl, the Bering Sea and Aleutian Islands pollock trawl and the Bering Sea and Aleutian Islands pacific cod longline. Recently

observers have collected tissue samples of many of the killer whales which were killed incidental to commercial fisheries. Genetics analysis have indicated that the mortalities incidental to the Bering Sea and Aleutian Islands flatfish trawl and the Bering Sea and Aleutian Islands Pacific cod fisheries are of the "resident" type, and mortalities incidental to the Bering Sea and Aleutian Islands pollock trawl fisheries are of the "transient" type. The estimated minimum mortality rate for resident killer whales incidental to U.S. commercial fisheries recently monitored is 1.5 animals per year, based completed on observer data. The estimated minimum mortality rate for transient killer whales incidental to U.S. commercial fisheries recently monitored is 0.4 animals per year, based completely on observer data. (Angliss and Allen 2009)

Other Mortality

During the 1992 killer whale surveys conducted in the Bering Sea and western GOA, 9 of 182 individual whales in 7 of the 12 pods encountered had evidence of bullet wounds. The relationship between wounding due to shooting and survival is unknown. There have been no obvious bullet wounds observed on killer whales during recent surveys in the Bering Sea and western GOA. However, researchers have reported that killer whale pods in certain areas exhibit vessel avoidance behavior, which may indicate that shootings occur in some places. (Angliss and Allen 2009)

3.8.4.7 Minke Whale

Stock

Alaska

Regulatory Status

Minke whales (*Balaenoptera acutorostrata*) are not listed as threatened or endangered under the ESA or designated as depleted under the MMPA. Because minke whales are considered common in the waters off Alaska and the number of human-related removals are currently thought to be minimal, the Alaska stock is not considered a strategic stock.

Habitat Preferences

Minke whales typically occupy waters over the continental shelf, including inshore bays and some estuaries. In the eastern north Pacific, minke whales are found feeding off California and Washington State in waters over the continental shelf. Based on whaling catches and surveys worldwide, there is also a deep-ocean component to the minke whale's distribution. In the western North Pacific, minke whales occur extensively in deep waters. Most sightings of minke whales in the central-eastern Bering Sea occur along the upper slope in waters with a bottom depth of 328 to 656 ft (100 to 200 m). Minke whales are relatively common in the Bering and Chukchi Seas and in the inshore areas of the GOA. (DoN 2006)

Population Size and Trends

The NMFS recognizes three stocks of minke whales within the Pacific U.S. EEZ: a California/Oregon/Washington stock, an Alaskan stock, and a Hawaiian stock (Carretta et al. 2006). There are no current estimates of abundance are available for minke whales in Alaskan waters (Angliss and Allen 2009). For purposes of acoustic impact modeling, a density of 0.0006/km^2 was derived for minke whales in the TMAA as described in detail in Appendix E.

Distribution

Minke whales are distributed in polar, temperate, and tropical waters (Jefferson et al. 1993); they are less common in the tropics than in cooler waters. Minke whales are present in the North Pacific from near the equator to the Arctic. The number of sightings of minke whales in the GOA is generally sparse. The summer range extends to the Chukchi Sea. In the winter, minke whales are found south to within 2° of the

equator. The distribution of minke whale vocalizations (specifically, "boings") suggests that the winter breeding grounds are the offshore tropical waters of the North Pacific Ocean. In the northern part of their range, minke whales are believed to be migratory, although there is no obvious migration from low-latitude, winter breeding grounds to high-latitude, summer feeding locations in the western North Pacific as there is in the North Atlantic. However, there are some monthly changes in densities in both high and low latitudes. Minke whales are seen in several locations year-round in the eastern north Pacific. (Angliss and Allen 2009)

It is believed that minke whales are more abundant in the nearshore waters of the Aleutian Islands than in the waters of the TMAA. Minke whales are known to be a migratory species; however, the patterns are not as well-known or defined as for some other species, such as gray and humpback whales. There are no winter sightings of this species in this area. (DoN 2006)

The number of sightings of minke whales in the GOA is generally sparse (DoN 2006). Large numbers of minke whales were reported at Portlock Bank (in the TMAA) and Albatross bank (west of the TMAA) during May 1976; however, subsequent NMFS surveys encountered none at those locations (Fiscus et al. 1976). Six sightings in shallow water (<656 ft [200 m]) and two in deep water (>3,281 ft [1,000 m]) were reported in 1987. Waite (2003) reported three sightings at or inshore of the shelf break in the northern margin of the TMAA. Two encounters totaling three individual minke whales occurred on the shelf during the April 2009 survey although only one of these encounters (at Portlock Bank) was within the TMAA (Rone et al. 2009).

Life History

Although minke whales are distributed in polar, temperate, and tropical waters (Jefferson et al. 1993), there is no obvious migration from low-latitude, winter breeding grounds to high-latitude, summer feeding locations in the western North Pacific (Horwood 1990).

Reproduction/Breeding

Stewart and Leatherwood (1985) suggested that mating occurs in winter or early spring although it had never been observed. There are no known areas used by minke whales for reproduction or calving in the TMAA.

Diving Behavior

Details of minke whale dive behavior as characterized for acoustic modeling are provided in Appendix D. A general surfacing pattern of minke whales consisting of about four surfacings interspersed by short-duration dives averaging 38 sec have been recorded. After the fourth surfacing, there was a longer duration dive ranging from approximately 2 to 6 min. Minke whales are lunge-feeding "gulpers," like most other rorquals. (DoN 2006)

Acoustics

Recordings of minke whale sounds indicate the production of both high- and low-frequency sounds (range: 0.06 to 20 kHz, see Table 3.8-3). Minke whale sounds have a dominant frequency range of 0.06 kHz to greater than 12 kHz, depending on sound type. There are two basic forms of pulse trains: a "speed-up" pulse train (dominant frequency range: 0.2 to 0.4 kHz) with individual pulses lasting 40 to 60 milliseconds (ms), and a less common "slow-down" pulse train (dominant frequency range: 50 to 0.35 kHz) lasting for 70 to 140 ms. Source levels for this species have been estimated to range from 151 to 175 dB re 1 ìPa @ 1 m. Source levels for some minke whale sounds have been calculated to range from 150 to 165 dB re 1 ìPa @ 1 m. In the Southern Hemisphere a complex and stereotyped sound sequence ("star-wars vocalization") was recorded. This sound sequence spanned a frequency range of 50 Hz to 9.4 kHz. Broadband source levels between 150 and 165 dB re 1 ìPa @ 1 m were calculated. "Boings" recorded in

the North Pacific have many striking similarities to the star-wars vocalization in both structure and acoustic behavior. "Boings," recently confirmed to be produced by minke whales and suggested to be a breeding display, consist of a brief pulse at 1.3 kHz followed by an amplitude-modulated call with greatest energy at 1.4 kHz, with slight frequency modulation over a duration of 2.5 sec. (DoN 2006) While no empirical data on hearing ability for this species are available, Ketten (1997) hypothesized that mysticetes are most adapted to hear low to infrasonic frequencies.

Impacts of Human Activity

Fisheries Interactions

Six different commercial fisheries operating in Alaska waters within the range of the Alaska minke whale stock were monitored for incidental take by NMFS observers during 2000-2004: Bering Sea and Aleutian Islands groundfish trawl, longline and pot fisheries, and GOA groundfish trawl, longline, and pot fisheries. The Bering Sea/Aleutian Islands groundfish trawl fisheries caused one mortality of a minke whale in 2000. The total estimated mortality and serious injury incurred by this stock as a result of interactions with U.S. commercial fisheries is 0.32 minke whales annually.

3.8.4.8 Pacific White-sided Dolphin

Stock

North Pacific

Regulatory Status

Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The North Pacific stock is not classified as strategic.

Habitat Preferences

Pacific white-sided dolphins occur in temperate North Pacific waters over the outer continental shelf and slope, and in the open ocean. In the eastern north Pacific, the species occurs from the southern Gulf of California, north to the GOA, west to Amchitka in the Aleutian Islands, and is rarely encountered in the southern Bering Sea. The species is commonly found on both the high seas and along the continental margins, and animals are known to enter the inshore passes of Alaska, British Columbia, and Washington. (Angliss and Allen 2009, DoN 2006)

Population Size and Trends

The minimum population estimate for the North Pacific stock is 26,880 (CV=0.90) individuals (Angliss and Allen 2009). For purposes of acoustic impact modeling, a density of 0.0208/km^2 was derived for Pacific white-sided dolphins in the TMAA as described in detail in Appendix E.

Distribution

Pacific white-sided dolphins occur across the central North Pacific waters to latitudes as low as (or lower than) 38°N and northward to the Bering Sea and coastal areas of southern Alaska. Surveys suggest a seasonal north-south movement of Pacific white-sided dolphins in the eastern north Pacific, with animals found primarily off California during the colder water months and highest densities shifting northward into Oregon and Washington State as water temperatures increase during late spring and summer. (Angliss and Allen 2009; DoN 2006)

Pacific white-sided dolphins occur regularly year-round throughout the GOA. They are widely distributed along the shelf break, continental slope, and in offshore waters. Inshore movements of Pacific white-sided dolphins are not common, but instances have been documented in Washington State, British Columbia,

and southeast Alaska. In Alaska, peak abundance is between July and August, when Pacific white-sided dolphins tend to congregate near the Fairweather Grounds in the southeastern GOA and Portlock Bank in the northeast part of the TMAA. (Angliss and Allen 2009; DoN 2006)

Previous survey data did not indicate the potential for a large number of Pacific white-sided dolphins in the vicinity of the TMAA (DoN 2006). Waite (2003), however, reported sighting two large groups (an average group size 56) just off Kenai Peninsula. This was previously characterized as an area of rare occurrence (relatively shallow waters) (DoN 2006). As a result of this new information, for purposes of acoustic impact modeling Pacific white-sided dolphins are analyzed as having the second highest density for cetaceans in the TMAA. The GOALS survey encountered Pacific white-sided dolphins only once (a group of 60 individuals) although this was outside the TMAA inside the shelfbreak to the southeast of Kodiak Island (Rone et al. 2009).

Life History

The diet in the eastern North Pacific includes cephalopods and fish (Schwartz et al. 1992, Black 1994, Heise 1997, Brownell et al. 1999, Morton 2000), and includes salmonids off Washington (Stroud et al. 1981). In this gregarious species, group sizes range from tens to thousands of dolphins (Leatherwood et al. 1984). They frequently aggregate with Risso's and northern right whale dolphins (Brownell et al. 1999).

Reproduction/Breeding

Calving occurs from June through August (Heise 1997). There are no known areas used by pacific white-sided dolphins for reproduction or calving in the TMAA.

Diving Behavior

Details regarding the characterization of diving behavior for input into acoustic impact modeling for Pacific white-sided dolphins are provided in Appendix D. Pacific white-sided dolphins in the eastern north Pacific feed primarily on epipelagic fishes and cephalopods. This does not appear to be a deep-diving species. Based on feeding habits, it has been inferred that Pacific white-sided dolphins dive to at least 120 m. The majority of foraging dives last less than 15 to 25 sec. (DoN 2006)

Acoustics

Vocalizations produced by Pacific white-sided dolphins include whistles and echolocation clicks. Whistles are in the frequency range of 2 to 20 Hz. Echolocation clicks range in frequency from 50 to 80 kHz (see Table 3.8-3); the peak amplitude is 170 dB re 1 µPa @ 1 m. (DoN 2006)

Tremel et al. (1998) measured the underwater hearing sensitivity of Pacific white-sided dolphins from 0.075 kHz through 150 kHz. The greatest sensitivities were from 2 to 128 kHz, while the lowest measurable sensitivities were 145 dB at 100 Hz and 131 dB at 140 kHz. Below 8 Hz and above 100 kHz, this dolphin's hearing was similar to that of other toothed whales. (DoN 2006)

Impacts of Human Activity

Fisheries Interactions

As a result in changes in fishery practices, there were no serious injuries or mortalities incidental to observed commercial fisheries between 2000 and 2004 for this species. (Angliss and Allen 2009)

3.8.4.9 Stejneger's Beaked Whale

Stock

Alaska

Regulatory Status

Stejneger's beaked whales (*Mesoplodon stejnegeri*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The Alaska stock is not classified as strategic.

Habitat Preferences

Stejneger's beaked whales (also called Bering Sea beaked whales) appear to prefer cold-temperate and subpolar waters, although strandings have been reported as far south as Monterey, California (Reeves et al. 2002). World-wide, beaked whales normally inhabit continental slope and deep oceanic waters (>656 ft [200 m]). In many locales, occurrence patterns have been linked to physical features, in particular, the continental slope, canyons, and escarpments, and oceanic islands. Off Alaska, this species has been observed in waters ranging in bottom depth from 2,395 to 5,118 ft (730 to 1,560 m) on the steep slope of the continental shelf as it drops off into the Aleutian Basin which exceeds 11,483 ft (3,500 m) in bottom depth. (DoN 2006)

Population Size and Trends

No current estimates of abundance are available for Stejneger's beaked whales in Alaskan waters (Angliss and Allen 2009). Groups of 3 to 15 Stejneger's beaked whales were sighted on a number of occasions in the 1980s near the central Aleutian Islands (Rice 1986). There were no beaked whales detected acoustically or visually (although two groups of unidentified small whale were sighted) during the April 2009 survey of the TMAA (Rone et al. 2009). It has been suggested, however, that Stejneger's beaked whales are probably the most common beaked whales in these Alaskan waters (DoN 2006). For that reason, analysis of impacts for Stejneger's beaked whales will be considered using the results of acoustic impact modeling from Cuvier's beaked whales as a surrogate, given that sufficient information exists for Cuvier's beaked whales, they are in the same taxonomic family, and the predicted density of Cuvier's beaked whale in GOA is higher than that of Baird's beaked whales and therefore presumably errs on the side of overestimation.

Distribution

Stejneger's beaked whales (also called Bering Sea beaked whales) appear to prefer cold-temperate and subpolar waters and are found only in the North Pacific. The Alaska stock is recognized as separate from the species off California (Angliss and Outlaw 2007). Off Alaska, this species has been observed in waters ranging in bottom depth from 730 to 1,560 m (2,395 to 5,118 ft) on the steep slope of the continental shelf as it drops off into the Aleutian Basin (which exceeds 3,500 m [11,482 ft] in bottom depth) (DoN, 2006). Stejneger's beaked whales are found only in the North Pacific. The species range from the waters off southern California, north to the Bering Sea, and south to the Sea of Japan (Reeves et al. 2003).

Life History

Observed group sizes for beaked whales are typically small. Stejneger's beaked whales have been observed in groups of 5 to 15 individuals, often containing individuals of mixed sizes (Jefferson et al. 1993). Most sightings of beaked whales are brief since these whales are often difficult to approach and they actively avoid aircraft and vessels (e.g., Würsig et al. 1998).

Reproduction/Breeding

There is no available information on the reproduction or breeding of this species. There are no known areas used by Stejneger's beaked whales for reproduction or calving in the TMAA.

Diving Behavior

Most sightings of beaked whales are brief since these whales are often difficult to approach, and they actively avoid aircraft and vessels. Stejneger's beaked whale stomach contents include squids and pelagic fish. Until recently, it was thought that all beaked whales probably feed at or close to the bottom in deep oceanic waters, taking whatever suitable prey was encountered or was locally abundant, by suction-feeding. However, based on recent tagging data from Cuvier's and Blainville's beaked whales, it is suggested that feeding might actually occur at midwater rather than only at or near the bottom. Durations of long dives for *Mesoplodon* species are over 20 min. (DoN 2006)

Acoustics

There is no information available for Stejneger's beaked whale vocalizations. Sounds recorded from beaked whales are, in general, divided into two categories: whistles and pulsed sounds (clicks), with whistles likely serving a communicative function, and pulsed sounds being important in foraging and/or navigation. Whistle frequencies are about 2 to 12 kHz, while pulsed sounds range in frequency from 300 Hz to 135 kHz, however, higher frequencies may not be recorded due to equipment limitations. (DoN 2006)

There is no empirical information available on the hearing abilities of Stejneger's beaked whales. (DoN 2006)

Impacts of Human Activity

Fisheries Interactions

From 1990 to 2002, six different commercial fisheries operating within the range of the Alaska stock of Stejneger's beaked whale were monitored for incidental take. These fisheries included Bering Sea (and Aleutian Islands) ground fish trawl, longline, and pot fisheries and GOA groundfish trawl, longline, and pot fisheries. No Stejneger's beaked whale mortalities were observed. (Angliss and Outlaw 2007)

3.8.5 Non-ESA Pinniped Species

3.8.5.1 California Sea Lion

Stock

United States

Regulatory Status

California sea lions (*Zalophus californianus*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The U.S. stock is not classified as strategic.

Habitat Preferences

Alaska waters are north of the main breeding and feeding range located in California. California sea lions congregate near rookery islands in California waters and typically feed over the continental shelf staying within approximately 27 nm (50 km) of rookery islands although are occasionally sighted up to several hundred kilometers offshore (DoN 2006). California sea lions recorded in Alaska usually are observed at Steller sea lion rookeries and haulout sites and are present throughout the year (DoN 2006).

Population Size and Trends

The U.S. stock of California sea lions can be found in the GOA. The estimated stock is 238,000 individuals (Carretta et al. 2007). This number is from counts during the 2001 breeding season of animals that were ashore at the four major rookeries in Southern California and at haulout sites north to the Oregon/California border. Sea lions that were at sea or were hauled out at other locations were not counted (Carretta et al. 2007). The general trend for this stock is that the population is growing (Carretta et al. 2007). There are not sufficient numbers of individuals of this species present in the TMAA to allow for acoustic impact modeling given they are rare.

Distribution

The primary rookeries for California sea lions are located on the California Channel Islands. California sea lions appear to be extending their feeding range farther north and increasing numbers of sightings are recorded in Alaskan waters (Maniscalco et al. 2004). The first recorded account of a California sea lion in Alaska was in 1973 at Point Elrington in the northern GOA (Maniscalco et al. 2004). Since then, California sea lions have been sighted throughout Alaska from Forrester Island in southeast Alaska to St. Matthews Bay, Prince William Sound, and St. Paul Island in the Bering Sea. Both male and female California sea lions have been observed as far north as the Pribilof Islands in the Bering Sea in recent years (Maniscalco 2002, DoN 2006). The few California sea lions recorded in Alaska usually are observed at Steller sea lion rookeries and haulout sites with most sightings recorded between March and May although they may be found in the GOA throughout the year. (Maniscalco et al. 2004, DoN 2006).

Life History

Survey data from 1975 to 1978 were analyzed to describe the seasonal shifts in the offshore distribution of California sea lions (Bonnell and Ford 1987). During summer, the highest densities were found immediately west of San Miguel Island. During autumn, peak densities of sea lions were centered on Santa Cruz Island. During winter and spring, peak densities occurred just north of San Clemente Island. The seasonal changes in the center of distribution were attributed to changes in the distribution of the prey species. If California sea lion distribution is determined primarily by prey abundance, these same areas might not be the center of sea lion distribution every year.

The distribution and habitat use of California sea lions vary with the sex of the animals and their reproductive phase. Adult males haul out on land to defend territories and breed from mid-to-late May until late July. Individual males remain on territories for 27–45 days without going to sea to feed. During August and September, after the mating season, the adult males migrate northward to feeding areas as far away as the GOA (Lowry et al. 1991). They remain there until spring (March–May), when they migrate back to the breeding colonies. Distribution of immature California sea lions is less well known, but some make northward migrations that are shorter in length than the migrations of adult males (Huber 1991). However, most immature seals are presumed to remain near the rookeries (Lowry et al. 1991). Adult females remain near the rookeries throughout the year.

Reproduction/Breeding

Most sea lion births occur from mid-June to mid-July (peak in late June) on the island rookeries in California and Mexico. GOA is outside the known breeding range for California sea lion. There are no known areas used by California sea lions for reproduction or calving in the TMAA.

Diving Behavior

California sea lions usually do not need to dive very deeply, since most of their food is found in shallow waters, about 85 to 243 ft (26 to 74 m) deep. They can, however, dive to depths of about 900 ft (274 m).

California sea lions typically stay submerged 3 min or less; however, they can remain submerged for as long as 10 min. (Carretta et al. 2007)

Acoustics

In air, California sea lions make incessant, raucous barking sounds; these have most of their energy at less than 2 kHz. The male barks have most of their energy at less than 1 kHz. Males vary both the number and rhythm of their barks depending on the social context; the barks appear to control the movements and other behavior patterns of nearby conspecifics. Females produce barks, squeals, belches, and growls in the frequency range of 0.25 to 5 kHz, while pups make bleating sounds at 0.25 to 6 kHz (see Table 3.8-3). California sea lions produce two types of underwater sounds: clicks (or short-duration sound pulses) and barks. All underwater sounds have most of their energy below 4 kHz. (DoN 2006)

The range of maximal sensitivity underwater is between 1 and 28 kHz. Functional underwater high frequency hearing limits are between 35 and 40 kHz, with peak sensitivities from 15 to 30 kHz. California sea lions show relatively poor hearing at frequencies below 1,000 Hz. Peak sensitivities in air are shifted to lower frequencies; the effective upper hearing limit is approximately 36 kHz. The best range of sound detection is from 2 to 16 kHz. Older sea lions (22 to 25 years of age) show in-air and underwater hearing losses that range from 10 dB at lower frequencies to 50 dB near the upper frequency limit. It has been determined that hearing sensitivity generally worsens with depth—hearing thresholds were lower in shallow water, except at the highest frequency tested (35 kHz), where this trend was reversed. (DoN 2006)

Impacts of Human Activity

Fisheries Interactions

Between 2000 and 2004, the mean annual serious injury and mortality to California sea lions from fisheries in California was 159 individuals. Other mortalities (boat collisions, power plant intake entrapment, shootings, marine debris, and unknown) added an additional 74 sea lions annually (NMFS 2007).

3.8.5.2 Harbor Seal

Stock

Three separate stocks of harbor seals are currently recognized in Alaska waters although there is substantial evidence that the population is more finely divided and may consist of a minimum of 12 stocks (DoN 2006, Angliss and Allen 2009). The three currently recognized stocks under MMPA are: Southeast Alaska stock (the Alaska/British Columbia border to Cape Suckling, Alaska), the Bering Sea stock (including all waters north of Unimak Pass), and the Gulf of Alaska stock (Cape Suckling, Alaska to Unimak Pass and throughout the Aleutian Islands). Animals from the Gulf of Alaska stock may be found in the TMAA.

Regulatory Status

Harbor Seal (*Phoca vitulina richardsi*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The U.S. stock is not classified as strategic.

Habitat Preferences

Harbor seals are coastal animals that primarily occur within 11 nm (20 km) from shore (Baird 2001, Lowery et al. 2001, Small et al. 2005). Harbor seals are considered abundant throughout most of their range which extends from Baja California to the eastern Aleutian Islands. In Alaska, they range from the Dixon Entrance to Kuskokwim Bay, are widely distributed along the coastal GOA (Angliss and Outlaw

2007), and are also found on offshore islands (Hoover 1988). There are over 300 coastal haulout sites for harbor seals in the GOA (Boveng et al. 2003). Harbor seals are abundant in fjords with tidewater glaciers, Prince William Sound, in several areas in the Kodiak Archipelago, and in major estuaries, particularly along the north side of the Alaska Peninsula (Hoover 1988, Lowrey et al. 2001, Boveng et al. 2003). There are haul outs along the shoreline of southeast Alaska, the south side of the Alaska Peninsula, the Aleutian Islands, and Middleton and Montague Islands (Hoover 1988, Lowrey et al. 2001). There is none of the harbor seal's preferred coastal habitat within the waters of the TMAA.

Population Size and Trends

Minimum population estimates for the Gulf of Alaska stock is 45,975 (CV=0.04) (Angliss and Allen 2009).

Distribution

The harbor seal is one of the most widespread of the pinniped species distributed from the eastern Baltic Sea, west across the Atlantic and Pacific Oceans to southern Japan, along the coast and offshore islands of Gulf of Alaska (DoN 2006). The harbor seal's preferred coastal habitat does not extend into the waters of the TMAA. Studies using satellite tags have documented the movements and home range of harbor seals in the vicinity of the TMAA (Lowry et al. 2001, Small et al. 2005). Although these tagging studies have documented harbor seal movement into deep water (beyond the shelf break) in the GOA, these movements are the exception. With few exceptions, harbor seals will be located in shallow nearshore areas and not at sea in the TMAA. Harbor seals, therefore, should be very rare in the small section of the TMAA nearest Kenai Peninsula, Montague Island, and Middleton Island. No harbor seals were encountered within the TMAA during the April 2009 GOALS survey (Rone et al. 2009).

Life History

On land, harbor seals tend to congregate in small groups of about 30 to 80 individuals, although larger groups are found in areas where food is plentiful. In Alaska, group size at haulouts ranges from 25 animals to more than 1,000 in some areas. (DoN 2006)

Information from tagged seals has indicated movement from haulouts to sea was age dependent with 3-5 nm (5-10 km) for adults and 5-14 nm (10-25 km) for juveniles (Lowry et al. 2001). Although some harbor seal pups made extensive movements, approximately 97% of pups were located less than 25 km from their haulouts (Small et al. 2005).

Reproduction/Breeding

In the Gulf of Alaska, male harbor seals attain sexual maturity around 5 to 6 years of age, while females are usually sexually mature at 5 years. Pups are typically born from late May through June. In general, the pupping season lasts up to 10 weeks with a two-week peak. Suckling harbor seal pups spend as much as 40% of their time in the water. The nursing period is approximately four to six weeks and after the pups are weaned, mating, which takes place in the water, may take place shortly thereafter. In the Gulf of Alaska, mating takes place from late June through July. Delayed implantation occurs for about 11 weeks after mating. (Don 2006)

Diving Behavior

Harbor seals are generally shallow divers. About 50% of their diving is shallower than 40 m, and 95% is shallower than 250 m. Dive durations are typically shorter than 10 min, with about 90% lasting less than 7 min. A tagged harbor seal in Monterey Bay dove as deep as 481 m. Harbor seal pups swim and dive with their mothers, although they dive for short periods compared with their mothers. Recorded dive durations for older individuals may be as long as 32 min. (DoN 2006)

Acoustics

Harbor seal males produce a variety of low-frequency (<4 kHz) in-air vocalizations including snorts, grunts, and growls, while pups make individually unique calls for mother recognition (contain multiple harmonics with main energy below 0.35 kHz). Adult males also produce several underwater sounds during the breeding season that typically range from 0.025 to 4 kHz (duration range: 0.1 s to multiple seconds) with individual variation in the dominant frequency range of sounds between different males. (DoN 2006)

Harbor seals hear nearly as well in air as underwater (Kastak and Schusterman 1998). Harbor seals hear frequencies from 1 to 180 kHz (most sensitive at frequencies below 50 kHz; above 60 kHz sensitivity rapidly decreases) in water and from 0.25 kHz to 30 kHz in air (most sensitive from 6 to 16 kHz using behavior and auditory brainstem response testing). (DoN 2006)

Impacts of Human Activity

Fisheries Interactions

Harbor seals often become caught in from gillnets when attempting to salmon that have been caught. For the Gulf of Alaska stock, the estimated minimum annual mortality rate incidental to commercial fisheries is 24 animals (Angliss and Allen 2009).

Subsistence Interactions

The MMPA restricts the hunting of harbor seals to Alaska Natives. In some areas, harbor seals are an important part of the subsistence economy. Angliss and Allen (2008) report that based on data from Alaska Department of Fish and Game for the years 2000 to 2004, the annual number of harbor seal taken from the Gulf of Alaska stock is 795 animals.

3.8.5.3 Northern Elephant Seal

Stock

California Breeding

Regulatory Status

Northern elephant seals (*Mirounga angustirostris*) are not listed as threatened or endangered under the ESA or depleted under the MMPA. The California Breeding stock is not classified as strategic.

Habitat Preferences

Breeding and molting habitats for northern elephant seals are characterized by sandy beaches, mostly on offshore islands, but also in some mainland locations, along the coast. When on shore, seals will also use small coves and sand dunes behind and adjacent to breeding beaches. They rarely enter the water during the breeding season, but some seals will spend short periods in tide pools and alongshore; these are most commonly weaned pups that are learning to swim. Feeding habitat is mostly in deep, offshore waters of warm temperate to subpolar zones. Some seals will move into subtropical or tropical waters while foraging. (DoN 2006)

Population Size and Trends

The California Breeding stock of the northern elephant seal has recovered from near extinction in the early 1900s to an estimated 124,000 (Carretta et al., 2007). Current census data suggest an increasing population trend. Although movement and genetic exchange continue between rookeries, most elephant seals return to their natal rookeries to breed. The California and Mexican Breeding groups may be demographically isolated and are currently considered two separate stocks. Individuals from the

California Breeding stock do occur in the GOA, typically only sub-adult and adult male elephant seals forage in the GOA (Le Boeuf et al. 2000). The population size has to be estimated since all age classes are not ashore at any one time of the year. There are now at least 101,000 elephant seals in the California Breeding stock (Carretta et al. 2007), Numbers in this stock are increasing by around 6 percent annually (Stewart et al. 1994, Carretta et al. 2007). For purposes of acoustic impact modeling, a density of 0.0022/km^2 was derived for elephant seals in the TMAA as described in detail in Appendix E.

Distribution

Northern elephant seals are endemic to the North Pacific Ocean, occurring almost exclusively in the eastern and central North Pacific. Adult males range further north into the GOA and along the Aleutian Islands. Vagrant individuals do sometimes range to the western North Pacific. The most far-ranging known individual appeared on Nijima Island, off the Pacific coast of Japan in 1989 demonstrating the great distances these animals are capable of covering. (DoN 2006)

Adult males and females segregate while foraging and migrating (Stewart and DeLong 1995, Stewart 1997). Adult females mostly range east to about 173°W, between the latitudes of 40°N and 45°N remaining far to the west of the TMAA. In contrast, adult males range further north and east into the GOA and along the Aleutian Islands to between 47°N and 58°N (Stewart and Huber 1993, Stewart and DeLong 1995, Le Boeuf et. al. 2000). Northern elephant seal males regularly occur in the GOA year-round (Calkins 1986). Adults stay offshore during migration, while juveniles and subadults are often seen along the coasts of Oregon, Washington State, and British Columbia (Condit and Le Boeuf 1984, Stewart and Huber 1993). Females may cover over 18,000 km (11,185 mi) and males over 21,000 km (13049 mi) during these postbreeding migrations (Stewart and DeLong 1995). There are few records of northern elephant seals being present in southeast Alaska. (DoN 2006)

Life History

Northern elephant seals haul out on land to give birth and breed from December through March, and pups remain hauled out through April. After spending time at sea to feed (post-breeding migration), they generally return to the same areas to molt (Odell 1974, Stewart and Yochem 1984, Stewart and DeLong 1995). However, they do not necessarily return to the same beach. Adult males tend to haul out to molt between June and August (peaking in July), whereas females and juveniles haul out to most between March and May (peaking in April). Sub-adult and adult male northern elephant seals are found in the MAA predominately in the spring and fall (Le Boeuf et al. 2000). For much of the year, northern elephant seals feed mostly in deep, offshore waters, and their foraging range extends thousands of kilometers offshore from the breeding range into the eastern and central North Pacific (Stewart and DeLong 1995, Stewart 1997, Le Boeuf et al. 2000). Adult males and females segregate while foraging and migrating; females mostly range west to about 173°W, between the latitudes of 40°N and 45°N, whereas males range further north into the GOA and along the Aleutian Islands, to between 47°N and 58°N (Stewart and Huber 1993, Stewart and DeLong 1995, Le Boeuf et al. 2000).

Reproduction/Breeding

The elephant seal pupping/breeding season occurs from December through March on the rookeries in California and Mexico. There are no known areas used by elephant seals for reproduction or calving in the TMAA.

Diving Behavior

Details regarding the characterization of diving behavior for input into acoustic impact modeling for elephant seals are provided in Appendix D. Elephant seals are probably the deepest and longest diving pinnipeds; few other mammals can match their abilities. Adults dive continuously, day and night, during their feeding migrations. Elephant seals may spend as much as 90 percent of their time submerged; this

year-round pattern of continuous, long, deep dives explains why northern elephant seals are rarely seen at sea and why their oceanic whereabouts and migrations have long been unknown. The average diving cycle consists of a 23-min dive, followed by a 2- to 4-min surface interval. The longest known dive is 106 min. Dives average between 1,148 and 1,805 ft (350 and 550 m) in depth and can reach as deep as 5,121 ft (1,561 m; females) and 5,200 ft (1,585 m; males). (DoN 2006)

Acoustics

Northern elephant seals produce loud, low-frequency in-air vocalizations. The mean fundamental frequencies are in the range of 147 to 334 Hz for adult males. The mean source level of the male produced vocalizations during the breeding season is 110 dB re 20 ìPa. In-air calls made by aggressive males include (1) snoring, which is a low-intensity threat; (2) a snort (0.2 to 0.6 kHz) made by a dominant male when approached by a subdominant male; and (3) a clap threat (<2.5 kHz) which may contain signature information at the individual level. Seismic (low frequency) vibrations accompany these in-air vocalizations; they are produced as males move about and vocalize on sand beaches. These sounds appear to be important social cues. The mean fundamental frequency of airborne calls for adult females is 500 to 1,000 Hz. In-air sounds produced by females include a <0.7 kHz belch roar used in aggressive situations and a 0.5 to 1 kHz bark used to attract the pup. Pups use a <1.4 kHz call to maintain contact with the mother. Evidence for underwater sound production by this species is scant. Except for one unsubstantiated report, none have been definitively identified. (DoN 2006)

The audiogram of northern elephant seals indicates that this species is well-adapted for underwater hearing; sensitivity is best between 3.2 and 45 kHz (see Table 3.8-3), with greatest sensitivity at 6.4 kHz and an upper frequency cutoff of approximately 55 kHz. Elephant seals exhibit the greatest sensitivity to low frequency (<1 kHz) sound among seals in which hearing has been tested. In-air hearing is generally poor, but is best for frequencies between 3.2 and 15 kHz, with greatest sensitivity at 6.3 kHz. The upper frequency limit in air is approximately 20 kHz. Elephant seals are relatively good at detecting tonal signals over masking noise. (DoN 2006)

Impacts of Human Activity

Fisheries Interactions

Stranding data reported to the California, Oregon, and Washington Marine Mammal stranding Networks in 2000-2004 include elephant seal injuries caused by hook-and-line fisheries (two injuries) and gillnet fisheries (one injury). The estimated mortality and serious injury of northern elephant seals (California Breeding stock) in commercial fisheries that might take this species is less than 8.8 animals per year. (Carretta et al. 2007)

Other Interactions

Stranding databases for California, Oregon, and Washington states that are maintained by NMFS contain the following records of human-related elephant seal mortalities and injuries in 2000-2004: (1) boat collisions (3 mortalities), (2) power plant entrainment (1 mortality), (3) shootings (4 mortalities), and (4) entanglement in marine debris (10 mortalities). This results in a minimum annual average of 1.6 nonfishery related mortalities for 2000-2004. (Carretta et al. 2007)

3.8.5.4 Northern Fur Seal

Stock

Eastern Pacific

Regulatory Status

The northern fur seal is not listed as threatened or endangered under the ESA. The Eastern Pacific stock of northern fur seal is classified as a strategic stock because it is designated as depleted under the MMPA.

Habitat Preferences

Northern fur seals are a highly oceanic species spending all but 35 to 45 days per year at sea. They are usually sighted 38 to 70 nm (70 to 130 km) from land along the continental shelf and slope, seamounts, submarine canyons, and sea valleys, where there are upwellings of nutrient-rich water. The Pribilof Islands in the Bering Sea are the rookery location for most of the worldwide population during the summer breeding season (Angliss and Allen 2009). Following the breeding season, most females and juveniles migrate south to waters off British Columbia, Washington, Oregon, and California, and most adult males remain in the GOA (DoN 2006).

Population Size and Trends

Two stocks of northern fur seals are recognized in U.S. waters: an Eastern Pacific stock and a San Miguel Island stock. The Eastern Pacific stock includes the Pribilof Island breeding group in the Bering Sea. The most recent population estimate for the Eastern Pacific stock is 665,550 (Angliss and Allen, 2008). The population of fur seals in the Pribilof Islands is declining for unknown reasons. The northern fur seal is a "strategic" stock because it is considered "depleted" under the MMPA because the population has declined from the 1.8 million animals estimated in the 1950s (Angliss and Outlaw 2006). For purposes of acoustic impact modeling, a density of 0.1180/km^2 was derived for northern fur seals in the TMAA as described in detail in Appendix E.

Distribution

Northern fur seals occur from Southern California north to the Bering Sea and west to the Okhotsk Sea and Honshu Island, Japan (Carretta et al. 2006). They are a coldwater species and when at sea they are usually sighted in forage areas along the continental shelf and slope 38 to 70 nm (70 to 130 km) from land and along the continental shelf and slope where they typically forage (Kajimura 1984). The Eastern Pacific stock spends May–November in northern waters and at northern breeding colonies (north of the GOA). In late November, females and young begin to arrive in offshore waters of California, with some animals moving south into continental shelf and slope waters. Adult males from the Eastern Pacific stock generally migrate only as far south as the GOA (Kajimura 1984). Maximum numbers are found in the southern extent of their range in waters from 42ºN to 34ºN during February–April. By early June, most seals of the Eastern Pacific stock have migrated back to northern waters (Antonelis and Fiscus 1980).

Peak abundance in the TMAA should occur between March and June during the annual migration north to the Pribilof Islands breeding grounds (Fiscus et al. 1976, Consiglieri et al. 1982). Tagging data presented by Ream et al. (2005) indicate the main foraging areas and the main migration route through the GOA are located far to the west of the TMAA. There are no rookeries or haulout sites in the vicinity of the TMAA. Some northern fur seals, particularly juvenile males and nonpregnant females, remain in the GOA throughout the summer and have been documented in the nearshore waters of Southeastern Alaska, Prince William Sound, Portlock Bank, and the middle of the GOA (Calkins 1986, Fiscus et al. 1976). (DoN 2006) The 2009 GOALS survey (Rone et al. 2009) did not encounter any northern fur seals in the TMAA although the acoustic analysis assumes they are the second-most abundant marine mammal in the area. It is likely, therefore, that effects from Navy activities on this species in this analysis are an overestimate.

Life History

Northern fur seals are solitary at sea but tend to congregate in food-rich areas where as many as 100 individuals have been sighted (Antonelis and Fiscus 1980, Kajimura 1984). Northern fur seals feed opportunistically on a variety of fish and squids species throughout their range (Kajimura, 1984).

Northern fur seals are gregarious during the breeding season and maintain a complex social structure on the rookeries. The largest rookery is on St. Paul and St. George Islands in the Pribilof Islands Archipelago in Alaska. Smaller breeding colonies are located on the Kuril Islands, Robben Island, and the Commander Islands in Russia; Bogoslof Island in the southeastern Bering Sea; and San Miguel and the Farallon Islands in California (Pyle et al. 2001, Robson 2002).

Reproduction/Breeding

Pupping and breeding occur between June and August on the Pribilof Islands (York, 1987). Pups are weaned at around 4 months (Gentry, 1998). There are no known areas used by Northern fur seals for reproduction or calving in the TMAA.

Diving Behavior

Details regarding the characterization of diving behavior for input into acoustic impact modeling for northern fur seals are provided in Appendix D. Northern fur seals are solitary at sea but tend to congregate in food-rich areas where as many as 100 individuals have been sighted. The average dive time for northern fur seals is 2.6 min, with a maximum between 5 and 7 min. The deepest recorded dive is 679 ft (207 m), but most are between 66 and 459 ft (20 and 140 m) and are probably associated with feeding. (DoN 2006)

Acoustics

Northern fur seals produce underwater clicks, and in-air bleating, barking, coughing, and roaring sounds. Males vocalize (roar) almost continuously at rookeries. Females and pups produce airborne sounds (bawls) to reunite after separation. The hearing ability of this species has been measured in air and underwater by behavioral methods. (DoN 2006)

Of all the pinniped species for which hearing information is available, northern fur seals are the most sensitive to airborne sound. In air, this species can hear sounds ranging from 0.1 to 36 kHz, with best sensitivity from 2 to 16 kHz. There is an anomalous in-air hearing loss at around 4 or 5 kHz, which is attributed to a middle specialization. The underwater hearing range of northern fur seals ranges from 0.5 Hz to 40 kHz (most sensitive from 2 to 32 kHz). The underwater hearing sensitivity of this species is 15 to 20 dB better than in the air. (DoN 2006)

Impacts of Human Activity

Fisheries Interactions

The estimated mortality and serious injury of northern fur seals in commercial fisheries that might take this species is approximately 1.9 animals per year. (Angliss and Allen 2009)

Subsistence Interactions

Alaska Natives residing on the Pribilof Islands are allowed an annual subsistence harvest of northern fur seals, with a take range determined from annual household surveys. Between 2001 and 2006, there was an annual average of 667 seals harvested per year. (Angliss and Allen 2009)

Other Interactions

Mortality resulting from entanglement in marine debris has been implicated as a contributing factor in the previous decline of Eastern Pacific stock of northern fur seal. The average entanglement rate for adult males from 1998 to 2002 was 0.27 percent (Angliss and Allen 2009), and if that rate was sustained, the result would be approximately 1,900 mortalities to male fur seals based on the current minimum population estimate.

3.8.6 Current Requirements and Practices

As presented in Section 5.1.7, a comprehensive suite of protective measures and standard operating procedures (SOPs) is implemented by the Navy to avoid and reduce impacts to marine mammals. In particular, the following categories of measures all serve to reduce or eliminate potential impacts of Navy activities on marine mammals that may be present in the vicinity of training activities:

- Training personnel and watchstander to identify and locate nearby marine mammals;
- Maintaining minimum buffer zones for surface vessel approach to marine mammals;
- Maintaining minimum aircraft overflight buffer zones of critical habitat and pinniped rookeries and haulout sites;
- Maneuvering to avoid interactions and collisions with marine species;
- Reducing mid-frequency active sound from sonar when marine mammals are in the proximity of training activities; and
- Establishing marine mammal-free exclusion zones for activities involving at-sea explosions.

3.8.7 Environmental Consequences

As described previously in Section 3.8.1, the ROI for marine mammals is the TMAA, which is more than 12 nm (22 km) from the closest point of land. As such, this section distinguishes between U. S. territorial seas (shoreline to 12 nm [22 km]) and nonterritorial seas, (seaward of 12 nm [22 km]) for the purposes of applying the appropriate regulations (National Environmental Policy Act [NEPA] or Executive Order [EO] 12114) to analyze potential environmental effects. There are no activities in the Proposed Action taking place in U.S. territorial seas.

3.8.7.1 Regulatory Framework

The MMPA and ESA prohibit the unauthorized harassment of marine mammals and endangered species, and provide the regulatory processes for authorizing any such harassment that might occur incidental to an otherwise lawful activity. These two acts also establish the context for determining potentially adverse impacts to marine mammals from military activities.

Marine Mammal Protection Act

The MMPA of 1972 established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The act further regulates "takes" of marine mammals in the global commons (that is, the high seas) by vessels or persons under U.S. jurisdiction. The term "take," as defined in Section 3 (16 U.S.C. 1362) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." "Harassment" was further defined in the 1994 amendments to the MMPA, which provided two levels of harassment, Level A (potential injury) and Level B (potential behavioral disturbance).

The National Defense Authorization Act of Fiscal Year 2004 (Public Law 108-136) amended the definition of harassment as applied to military readiness activities or scientific research activities conducted by or on behalf of the federal government, consistent with Section 104(c)(3) [16 U.S.C. 1374 (c)(3)]. The Fiscal Year 2004 National Defense Authorization Act adopted the definition of "military readiness activity" as set forth in the Fiscal Year 2003 National Defense Authorization Act (Public Law 107-314). Military training activities within the TMAA constitute military readiness activities as that term is defined in Public Law 107-314 because training activities constitute "training and operations of the

Armed Forces that relate to combat" and constitute "adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use."

For military readiness activities, the relevant definition of harassment is any act that:

- Injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild ("Level A harassment").
- Disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered ("Level B harassment") [16 U.S.C. 1362 (18)(B)(i) and (ii)].

Section 101(a)(5) of the MMPA directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals by U.S. citizens who engage in a specified activity (exclusive of commercial fishing), if certain findings are made and regulations are issued. Permission will be granted by the Secretary for the incidental take of marine mammals if the taking will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses.

In support of the Proposed Action for the Preferred Alternative, the Navy is requesting a Letter of Authorization (LOA) pursuant to Section 101(a)(5)(A) of the MMPA. After the application was reviewed by NMFS, a Notice of Receipt of Application was published in the Federal Register on February 3, 2010 (75 FR 5575). Publication of the Notice of Receipt of Application initiated the 30-day public comment period, during which time anyone could obtain a copy of the application by contacting NMFS. In addition, the MMPA requires NMFS to develop regulations governing the issuance of an LOA and to publish these regulations in the Federal Register. Specifically, the regulations for each allowed activity establish (1) permissible methods of taking, and other means of affecting the least practicable adverse impact on such species or stock and its habitat, and on the availability of such species or stock for subsistence, and (2) requirements for monitoring and reporting of such taking. For military readiness activities (as described in the National Defense Authorization Act), a determination of "least practicable adverse impacts" on a species or stock that includes consideration, in consultation with the Department of Defense (DoD), of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.

Several species of marine mammals occur in the TMAA. Accordingly, the Navy has initiated the MMPA compliance process with NMFS, by submission of a request for a LOA.

Endangered Species Act

The ESA of 1973 established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. An "endangered" species is a species that is in danger of extinction throughout all or a significant portion of its range, while a "threatened" species is one that is likely to become endangered within the foreseeable future throughout all or in a significant portion of its range. The USFWS and NMFS jointly administer the ESA and are also responsible for the listing of species (designating a species as either threatened or endangered). The USFWS has primary management responsibility for management of terrestrial and freshwater species, while NMFS has primary responsibility for marine species and anadromous fish species (species that migrate from saltwater to freshwater to spawn). The ESA allows the designation of geographic areas as critical habitat for threatened or endangered species.

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Section

7(a)(2) requires each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a federal agency's action "may affect" a protected species, that agency is required to consult formally with the NMFS or the USFWS, depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR 402.14(a)). Under the terms of Section 7(b)(4) and Section 7(o)(2) of the ESA, taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement.

Seven marine mammal species that are listed as endangered under the ESA could potentially occur in the TMAA. Critical habitat for North Pacific right whales and Steller sea lions has been designated under the ESA; however, these areas are outside the action area of the TMAA. Accordingly, the Navy has initiated the ESA Section 7 consultation process with NMFS.

Executive Order 12114

EO 12114 directs federal agencies to provide for informed decision making for major federal actions outside the United States, including the global commons, the environment of a nonparticipating foreign nation, or impacts on protected global resources. An OEIS is required when an action has the potential to significantly harm the environment of the global commons. “Global commons” are defined as “geographical areas that are outside of the jurisdiction of any nation, and include the oceans outside territorial limits (outside 12 nm [22 km] from the coast) and Antarctica. Global commons do not include contiguous zones and fisheries zones of foreign nations” (32 C.F.R. 187.3). The Navy has published procedures for implementing EO 12114 in 32 C.F.R. 187, Environmental Effects Abroad of Major Department of Defense Actions, as well as the October 2007 Office of the Chief of Naval Operations Instruction (OPNAVINST) 5090.1C.

Unlike NEPA, EO 12114 does not require a scoping process. However, the EIS and OEIS have been combined into one document, as permitted under NEPA and EO 12114, in order to reduce duplication. Therefore, the scoping requirements found in NEPA were implemented with respect to actions occurring seaward of U.S. territorial seas (outside 12 nm [22 km]), and discussions regarding scoping requirements will reference the combined GOA Draft EIS/OEIS.

3.8.7.2 Approach to Analysis

This section describes potential environmental effects associated with conducting naval training activities for three proposed alternatives in the TMAA. These activities are configured in various combinations to define specific warfare areas. The activities under Alternatives 1 and 2 include use of active sonar; surface vessel, submarine, and aircraft warfare training activities; weapons firing and non-explosives ordnance use; electronic combat; and discharges of expendable materials.

This section distinguishes between U.S. territorial seas (shoreline to 12 nm [22 km]) and nonterritorial seas, (seaward of 12 nm [22 km]) for the purposes of applying the appropriate regulation (EO 12114) to analyze potential environmental effects.

Data Sources

A comprehensive and systematic review of relevant literature and data was conducted to complete this analysis. Of the available scientific and technical literature (both published and unpublished), the following types of documents were utilized: journals, books, periodicals, bulletins, DoD operations reports, theses, dissertations, endangered species recovery plans, species management plans, stock assessment reports, environmental impact statements, range complex management plans, and other

technical reports published by government agencies, private businesses, or consulting firms. Scientific and technical literature was also consulted during the search for geographic location data (geographic coordinates) on the occurrence of marine resources within the GOA.

Information was collected from the following sources to summarize the occurrence of and to evaluate the impacts to marine mammal species in the Study Area:

- Marine Resource Assessment (MRA) for the TMAA and marine mammal density estimates for the GOA;
- On-line databases: Ingenta, Web of Science; Aquatic Sciences and Fisheries Abstracts, Science Direct, Synergy, BIOSIS previews;
- The Internet, including various databases and related websites: National Oceanic and Atmospheric Administration (NOAA)-Coastal Services Center, NMFS, Ocean Biogeographic Information System, U.S. Geological Survey, WhaleNet, Blackwell-Science, FishBase, Food and Agriculture Organization, Federal Register, Pacific and North Pacific Fishery Management Councils;
- Federal and state agencies: the DoN, Pacific Fishery Management Council, NMFS Highly Migratory Species Division, NMFS Northwest Fisheries Science Center, NMFS Southwest Fisheries Science Center, NMFS Alaska Fisheries Science Center, NMFS Northwest Regional Office, NMFS Office of Habitat Protection, NMFS Office of Protected Resources, NOAA: Marine Managed Areas Inventory, USFWS Ecological Services Field Offices, U.S. Environmental Protection Agency, U.S. Geological Survey: Sirenia Project, Bureau of Land Management, Minerals Management Service, California Department of Fish and Game, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife; and
- Marine resource experts and specialists.

Assessment Methods

Each alternative analyzed in this EIS/OEIS includes several warfare areas (for example, Anti-Surface Warfare [ASUW] and Anti-Submarine Warfare [ASW]). Most warfare areas include multiple types of training activities (for example, ASW Tracking Exercise [TRACKEX]). Likewise, many activities (for example, vessel movements, aircraft overflights, and weapons firing) are common to many training scenarios. Accordingly, the analysis of the consequences to marine mammals is organized by specific activity and/or stressors associated with that activity, rather than warfare area.

The following general steps were used to analyze the potential environmental consequences of the alternatives to marine mammals:

- Identify those aspects of the Proposed Action that are likely to act as stressors to marine mammals by having a direct or indirect effect on the physical, chemical, and biotic environment. As part of this step, the spatial extent of these stressors, including changes in that spatial extent over time, were identified. The results of this step identified those aspects of the Proposed Action that required detailed analysis in this EIS/OEIS.
- Identify marine mammal resources that may occur in the action area.
- Identify the marine mammal resources that are likely to co-occur with the stressors in space and time, and the nature of that co-occurrence (exposure analysis).
- Determine whether and how marine mammals are likely to respond given their exposure to the proposed activities based on available scientific knowledge of their probable responses.

- Estimate the effectiveness of proposed mitigation measures in avoiding, offsetting, and reducing the intensity of any potential adverse impacts to marine mammals.
- Determine implications of the estimated risks under the ESA and MMPA.

Warfare Areas and Associated Environmental Stressors

Navy subject matter experts, in consultation with NMFS, identified the warfare areas and activities included in the Proposed Action to identify specific activities that could act as stressors to marine mammals. Public and agency scoping comments, previous environmental analyses, previous agency consultations, laws, regulations, executive orders, and resource-specific information were also evaluated. This process was used to organize the information presented and analyzed in the affected environment and environmental consequences sections of this EIS/OEIS. Potential stressors and the type of effect to marine mammals include:

- Vessel movements;
- Aircraft overflights;
- Non-explosive practice ordnance;
- High explosive ordnance (at-sea explosions);
- Active sonar; and
- Expended materials (ordnance related materials, targets, flares, chaff, sonobuoys, and marine dye markers).

As discussed in Section 3.2 (Expended Materials) and Section 3.4 (Acoustic Environment) of this EIS/OEIS, some water and air pollutants would be released into the environment as a result of the proposed action. Those sections indicated that any increases in water or air pollutant concentrations resulting from Navy training would be negligible and localized. Impacts to water and air quality would be less than significant. Thus, water and air quality changes would have no effect on marine mammals. Accordingly, the effects of water and air quality changes on marine mammals are not addressed further in this EIS/OEIS.

3.8.7.3 Acoustic Effects

Assessing Marine Mammal Responses to Sound

As summarized by the National Academies of Science (NAS), the possibility that human-generated sound could harm marine mammals or significantly interfere with their "normal" activities has been an issue of concern (National Research Council [NRC] 2005). This section evaluates the potential quantification for specific Navy acoustic sources proposed for use in the TMAA to result in harassment of or injury to marine mammals.

Assessing whether a sound may disturb or injure a marine mammal involves understanding the characteristics of the acoustic sources, the marine mammals that may be present in the vicinity of the sound, and the effects that sound may have on the physiology and behavior of those marine mammals. Although it is known that sound is important for marine mammal communication, navigation and foraging (NRC 2003b, NRC 2005), there are many unknowns in assessing the effects and significance of marine mammals responses to sound exposures related to the context for the exposure and the disposition of the marine mammal (Southall et al. 2007). For this reason, the Navy enlisted the expertise of NMFS as a cooperating agency. Their input assisted the Navy in developing a conceptual analytical framework for evaluating what sound levels marine mammals might receive as a result of Navy training actions, whether marine mammals might respond to these exposures, and whether that response might have a mode of

action on the biology or ecology of marine mammals such that the response should be considered a potential harassment. From this framework of evaluating the potential for harassment incidents to occur, an assessment of whether acoustic sources might impact populations, stocks or species of marine mammals can be conducted.

The flow chart in Figure 3.8-3 is a representation of the general analytical framework utilized in applying the specific thresholds discussed in this section. The framework presented in the flow chart is organized from left to right and is compartmentalized according to the phenomena that occur within each. These include the physics of sound propagation (Physics), the potential physiological processes associated with sound exposure (Physiology), the potential behavioral processes that might be affected as a function of sound exposure (Behavior), and the immediate effects these changes may have on functions the animal is engaged in at the time of exposure (Life Function – Proximate). These compartmentalized effects are extended to longer term life functions (Life Function – Ultimate) and into population and species effects ("life functions" are the basic processes organisms undergo to survive and reproduce such as feeding and breeding).

Throughout the flow chart, dotted and solid lines are used to connect related events. Solid lines designate those effects that "will" happen; dotted lines designate those that "might" happen but must be considered (including those hypothesized to occur but for which there is no direct evidence).

Some boxes contained within the flow chart are colored according to how they relate to the definitions of harassment in the MMPA. Red boxes correspond to events that are injurious. By prior ruling and usage, these events would be considered as Level A harassment under the MMPA. Yellow boxes correspond to events that have the potential to qualify as Level B harassment under the MMPA. Based on prior ruling, the specific instance of Temporary Threshold Shift (TTS) is considered as part of Level B harassment (Level B harassment includes TTS, non-TTS, and sub-TTS). Boxes that are shaded from red to yellow have the potential for injury (Level A harassment) and behavioral disturbance (Level B harassment).

The analytical framework outlined within the flow chart acknowledges that physiological responses must always precede behavioral responses (i.e., there can be no behavioral response without first some physiological effect of the sound) and an organization where each functional block only occurs once and all relevant inputs/outputs flow to/from a single instance.

Physics

Starting with a sound source, the attenuation of an emitted sound due to propagation loss is determined. Uniform animal distribution is overlaid onto the calculated sound fields to assess if animals are physically present at sufficient received sound levels to be considered "exposed" to the sound. If the animal is determined to be exposed, two possible scenarios must be considered with respect to the animal's physiology – effects on the auditory system and effects on nonauditory system tissues. These are not independent pathways and both must be considered since the same sound could affect both auditory and nonauditory tissues. Note that the model does not account for any animal response; rather the animals are considered stationary, accumulating energy until the threshold is tripped.

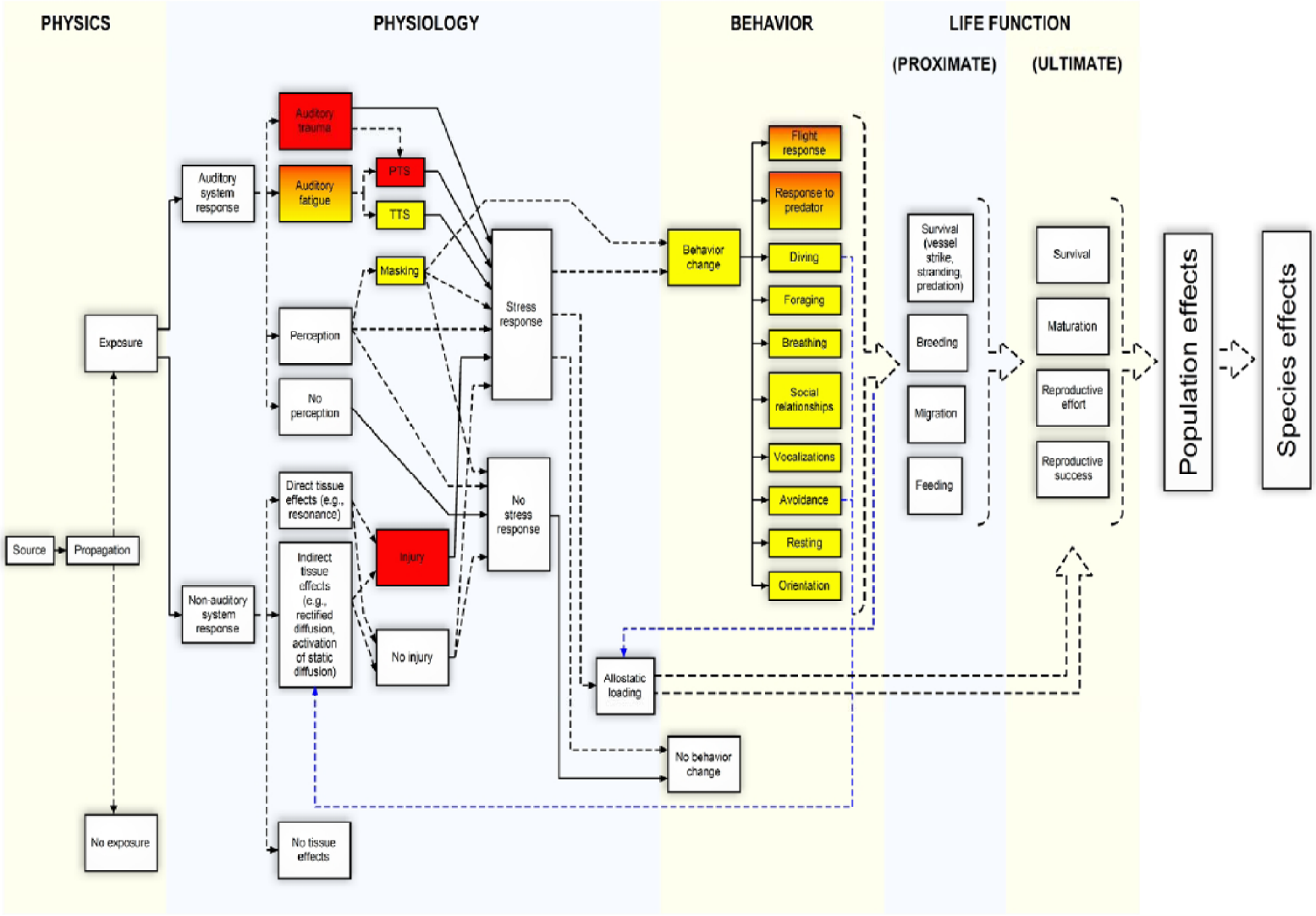


Figure 3.8-3: Analytical Framework for Evaluating Sonar Effects to Marine Mammals

Physiology

Potential impacts to the auditory system are assessed by considering the characteristics of the received sound (e.g., amplitude, frequency, duration) and the sensitivity of the exposed animals. Some of these assessments can be numerically based (e.g., TTS, Permanent Threshold Shift [PTS], perception). Others will be necessarily qualitative, due to lack of information, or will need to be extrapolated from other species for which information exists. Potential physiological responses to the sound exposure are ranked in descending order, with the most severe impact (auditory trauma) occurring at the top and the least severe impact occurring at the bottom (the sound is not perceived).

1. Auditory trauma represents direct mechanical injury to hearing related structures, including tympanic membrane rupture, disarticulation of the middle ear ossicles, and trauma to the inner ear structures such as the organ of Corti and the associated hair cells. Auditory trauma is always injurious but could be temporary and not result in PTS. Auditory trauma is always assumed to result in a stress response.

2. Auditory fatigue refers to a loss of hearing sensitivity after sound stimulation. The loss of sensitivity persists after, sometimes long after, the cessation of the sound. The mechanisms responsible for auditory fatigue differ from auditory trauma and would primarily consist of metabolic exhaustion of the hair cells and cochlear tissues. The features of the exposure (e.g., amplitude, frequency, duration, temporal pattern) and the individual animal's susceptibility would determine the severity of fatigue and whether the effects were temporary (TTS) or permanent (PTS). Auditory fatigue (PTS or TTS) is always assumed to result in a stress response.

3. Sounds with sufficient amplitude and duration to be detected among the background ambient noise are considered to be perceived. This category includes sounds from the threshold of audibility through the normal dynamic range of hearing (i.e., not capable of producing fatigue). To determine whether an animal perceives the sound, the received level, frequency, and duration of the sound are compared to what is known of the species' hearing sensitivity.

Since audible sounds may interfere with an animal's ability to detect other sounds at the same time, perceived sounds have the potential to result in auditory masking. Unlike auditory fatigue, which always results in a stress response because the sensory tissues are being stimulated beyond their normal physiological range, masking may or may not result in a stress response, depending on the degree and duration of the masking effect. Masking may also result in a unique circumstance where an animal's ability to detect other sounds is compromised without the animal's knowledge. This could conceivably result in sensory impairment and subsequent behavior change; in this case, the change in behavior is the *lack of a response* that would normally be made if sensory impairment did not occur. For this reason, masking also may lead directly to behavior change without first causing a stress response.

The features of perceived sound (e.g., amplitude, duration, temporal pattern) are also used to judge whether the sound exposure is capable of producing a stress response. Factors to consider in this decision include the probability of the animal being naïve or experienced with the sound (i.e., what are the known/unknown consequences of the exposure).

The received level is not of sufficient amplitude, frequency, and duration to be perceptible by the animal. By extension, this does not result in a stress response (not perceived).

Potential impacts to tissues other than those related to the auditory system are assessed by considering the characteristics of the sound (e.g., amplitude, frequency, duration) and the known or estimated response characteristics of nonauditory tissues. Some of these assessments can be numerically based (e.g., exposure required for rectified diffusion). Others will be necessarily qualitative, due to lack of information. Each of the potential responses may or may not result in a stress response.

1. Direct tissue effects – Direct tissue responses to sound stimulation may range from tissue shearing (injury) to mechanical vibration with no resulting injury. Any tissue injury would produce a stress response, whereas noninjurious stimulation may or may not.

2. Indirect tissue effects – Based on the amplitude, frequency, and duration of the sound, it must be assessed whether exposure is sufficient to indirectly affect tissues. For example, the hypothesis that rectified diffusion occurs is based on the idea that bubbles that naturally exist in biological tissues can be stimulated to grow by an acoustic field. Under this hypothesis, one of three things could happen: (1) bubbles grow to the extent that tissue hemorrhage occurs (injury); (2) bubbles develop to the extent that a complement immune response is triggered or nervous tissue is subjected to enough localized pressure that pain or dysfunction occurs (a stress response without injury); or (3) the bubbles are cleared by the lung without negative consequence to the animal. The probability of rectified diffusion, or any other indirect tissue effect, will necessarily be based on what is known about the specific process involved.

3. No tissue effects – The received sound is insufficient to cause either direct mechanical) or indirect effects to tissues. No stress response occurs.

The Stress Response

The acoustic source is considered a potential stressor if, by its action on the animal, via auditory or nonauditory means, it may produce a stress response in the animal. The term "stress" has taken on an ambiguous meaning in the scientific literature, but with respect to the discussions of allostasis and allostatic loading, the stress response will refer to an increase in energetic expenditure that results from exposure to the stressor and which is predominantly characterized by either the stimulation of the sympathetic nervous system (SNS) or the hypothalamic-pituitary-adrenal (HPA) axis (Reeder and Kramer 2005).

The presence and magnitude of a stress response in an animal depends on a number of factors. These include the animal's life history stage (e.g., neonate, juvenile, adult), the environmental conditions, reproductive or developmental state, and experience with the stressor.

Not only will these factors be subject to individual variation, but they will also vary within an individual over time. Prior experience with a stressor may be of particular importance as repeated experience with a stressor may dull the stress response via acclimation (St. Aubin and Dierauf 2001). In considering potential stress responses of marine mammals to acoustic stressors, each of these should be considered. For example, is the acoustic stressor in an area where animals engage in breeding activity? Are animals in the region resident and likely to have experience with the stressor (i.e., repeated exposures)? Is the region a foraging ground or are the animals passing through as transients? What is the ratio of young (naïve) to old (experienced) animals in the population? It is unlikely that all such questions can be answered from empirical data; however, they should be addressed in any qualitative assessment of a potential stress response as based on the available literature.

Marine mammals naturally experience stressors within their environment and as part of their life histories. Changing weather and ocean conditions, exposure to diseases and naturally occurring toxins, lack of prey availability, social interactions with conspecifics, and interactions with predators all contribute to the stress a marine mammal experiences. In some cases, naturally occurring stressors can have profound impacts on marine mammals; for example, chronic stress, as observed in stranded animals with long-term debilitating conditions (e.g., disease), has been demonstrated to result in an increased size of the adrenal glands and an increase in the number of epinephrine-producing cells (Clark et al. 2006). Anthropogenic activities have the potential to provide additional stressors above and beyond those that occur naturally. Potential stressors resulting from anthropogenic activities must be considered not only as to their direct

impact on the animal but also as to their cumulative impact with environmental stressors already experienced by the animal.

Studies on the stress response of odontocete cetaceans to acute acoustic stimuli were previously discussed Thomas et al. 1990, Miksis et al. 2001, Romano et al. 2004). Other types of stressors include the presence of vessels, fishery interactions, acts of pursuit and capture, the act of stranding, and pollution. In contrast to the limited amount of work performed on stress responses resulting from sound exposure, a considerably larger body of work exists on stress responses associated with pursuit, capture, handling and stranding. Pursuit, capture and short-term holding of belugas has been observed to result in a decrease in thyroid hormones (St. Aubin and Geraci 1988) and increases in epinephrine (St. Aubin and Dierauf 2001). In dolphins, the trend is more complicated with the duration of the handling time potentially contributing to the magnitude of the stress response (St. Aubin et al. 1996, Ortiz and Worthy 2000, St. Aubin 2002). Elephant seals demonstrate an acute cortisol response to handling, but do not demonstrate a chronic response; on the contrary, adult females demonstrate a reduction in the adrenocortical response following repetitive chemical immobilization (Engelhard et al. 2002). With respect to anthropogenic sound as a stressor, the current limited body of knowledge will require extrapolation from species for which information exists to those for which no information exists.

The stress response may or may not result in a behavioral change, depending on the characteristics of the exposed animal. However, provided a stress response occurs, we assume that some contribution is made to the animal's allostatic load. Allostasis is the ability of an animal to maintain stability through change by adjusting its physiology in response to both predictable and unpredictable events (McEwen and Wingfield 2003). The same hormones associated with the stress response vary naturally throughout an animal's life, providing support for particular life history events (e.g., pregnancy) and predictable environmental conditions (e.g., seasonal changes). The allostatic load is the cumulative cost of allostasis incurred by an animal and is generally characterized with respect to an animal's energetic expenditure. Perturbations to an animal that may occur with the presence of a stressor, either biological (e.g., predator) or anthropogenic (e.g., construction), can contribute to the allostatic load (McEwen and Wingfield 2003). Additional costs are cumulative and additions to the allostatic load over time may contribute to reductions in the probability of achieving ultimate life history functions (e.g., survival, maturation, reproductive effort and success) by producing pathophysiological states. The contribution to the allostatic load from a stressor requires estimating the magnitude and duration of the stress response, as well as any secondary contributions that might result from a change in behavior.

If the acoustic source does not produce tissue effects, is not perceived by the animal, or does not produce a stress response by any other means, Figure 3.8-3 assumes that the exposure does not contribute to the allostatic load. Additionally, without a stress response or auditory masking, it is assumed that there can be no behavioral change. Conversely, any immediate effect of exposure that produces an injury (i.e., red boxes on the flow chart in Figure 3.8-3) is assumed to also produce a stress response and contribute to the allostatic load.

Behavior

Acute stress responses may or may not cause a behavioral reaction. However, all changes in behavior are expected to result from an acute stress response. This expectation is based on the idea that some sort of physiological trigger must exist to change any behavior that is already being performed. The exception to this rule is the case of masking. The presence of a masking sound may not produce a stress response, but may interfere with the animal's ability to detect and discriminate biologically relevant signals. The inability to detect and discriminate biologically relevant signals hinders the potential for normal behavioral responses to auditory cues and is thus considered a behavioral change.

Numerous behavioral changes can occur as a result of stress response, and Figure 3.8-3 lists only those that might be considered the most common types of response for a marine animal. For each potential behavioral change, the magnitude in the change and the severity of the response needs to be estimated. Certain conditions, such as stampeding (i.e., flight response) or a response to a predator, might have a probability of resulting in injury. For example, a flight response, if significant enough, could produce a stranding event. Under the MMPA, such an event would be considered a MMPA Level A harassment. Each altered behavior may also have the potential to disrupt biologically significant events (e.g., breeding or nursing) and may need to be qualified as MMPA Level B harassment. Exposures to sonar resulting in non-TTS behavioral disturbance and exposure to at-sea explosions resulting in sub-TTS behavioral disturbance are quantified as MMPA Level B harassment. All behavioral disruptions have the potential to contribute to the allostatic load. This secondary potential is signified by the feedback from the collective behaviors to allostatic loading (physiology block).

The response of a marine mammal to an anthropogenic sound source will depend on the frequency content, duration, temporal pattern and amplitude of the sound as well as the animal's prior experience with the sound and the context in which the sound is encountered (i.e., what the animal is doing at the time of the exposure). The direction of the responses can vary, with some changes resulting in either increases or decreases from baseline (e.g., decreased dive times and increased respiration rate). Responses can also overlap; for example, an increased respiration rate is likely to be coupled to a flight response. Differential responses between and within species are expected since hearing ranges vary across species and the behavioral ecology of individual species is unlikely to completely overlap.

A review of marine mammal responses to anthropogenic sound was first conducted by Richardson and others in 1995. A more recent review (Nowacek et al. 2007) addresses studies conducted since 1995 and focuses on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated. The following sections provide a very brief overview of the state of knowledge of behavioral responses. The overviews focus on studies conducted since 2000 but are not meant to be comprehensive; rather, they provide an idea of the variability in behavioral responses that would be expected given the differential sensitivities of marine mammal species to sound and the wide range of potential acoustic sources to which a marine mammal may be exposed. Estimates of the types of behavioral responses that could occur for a given sound exposure should be determined from the literature that is available for each species or extrapolated from closely related species when no information exists.

Flight Response

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. Relatively little information on flight responses of marine mammals to anthropogenic signals exists, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus 1996). Flight responses have been speculated as being a component of marine mammal strandings associated with sonar activities (Evans and England 2001).

Response to Predators

Evidence suggests that at least some marine mammals have the ability to acoustically identify potential predators. For example, harbor seals that reside in the coastal waters off British Columbia are frequently targeted by certain groups of killer whales, but not others. The seals discriminate between the calls of threatening and non-threatening killer whales (Deecke et al. 2002), a capability that should increase survivorship while reducing the energy required for attending to and responding to all killer whale calls. The occurrence of masking or hearing impairment provides a means by which marine mammals may be prevented from responding to the acoustic cues produced by their predators. Whether or not this is a possibility depends on the duration of the masking/hearing impairment and the likelihood of encountering a predator during the time that predator cues are impeded.

Diving

Changes in dive behavior can vary widely. They may consist of increased or decreased dive times and surface intervals as well as changes in the rates of ascent and descent during a dive. Variations in dive behavior may reflect interruptions in biologically significant activities (e.g., foraging) or they may be of little biological significance. Variations in dive behavior may also expose an animal to potentially harmful conditions (e.g., increasing the chance of ship-strike) or may serve as an avoidance response that enhances survivorship. The impact of a variation in diving resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Nowacek et al. (2004) reported disruptions of dive behaviors in foraging North Atlantic right whales when exposed to an alerting stimulus, an action, they noted, that could lead to an increased likelihood of ship strike. However, the whales did not respond to playbacks of either right whale social sounds or vessel noise, highlighting the importance of the sound characteristics in producing a behavioral reaction. Conversely, Indo-Pacific humpback dolphins have been observed to dive for longer periods of time in areas where vessels were present and/or approaching (Ng and Leung 2003). In both of these studies, the influence of the sound exposure cannot be decoupled from the physical presence of a surface vessel, thus complicating interpretations of the relative contribution of each stimulus to the response. Indeed, the presence of surface vessels, their approach and speed of approach, seemed to be significant factors in the response of the Indo-Pacific humpback dolphins (Ng and Leung 2003). Low frequency signals of the Acoustic Thermometry of Ocean Climate (ATOC) sound source were not found to affect dive times of humpback whales in Hawaiian waters (Frankel and Clark 2000) or to overtly affect elephant seal dives (Costa et al. 2003). They did, however, produce subtle effects that varied in direction and degree among the individual seals, illustrating the equivocal nature of behavioral effects and consequent difficulty in defining and predicting them.

Due to past incidents of beaked whale strandings associated with sonar operations, feedback paths are provided between avoidance and diving and indirect tissue effects. This feedback accounts for the hypothesis that variations in diving behavior and/or avoidance responses can possibly result in nitrogen tissue supersaturation and nitrogen off-gassing, possibly to the point of deleterious vascular bubble formation (Jepson et al. 2003). Although hypothetical, the potential process is being debated within the scientific community.

Foraging

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (e.g., bubble nets or sediment plumes), or changes in dive behavior. Noise from seismic surveys was not found to impact the feeding behavior in western gray whales off the coast of Russia (Yazvenko et al. 2007) and sperm whales engaged in foraging dives did not abandon dives when exposed to distant signatures of seismic airguns (Madsen et al. 2006). Balaenopterid whales exposed to moderate low-frequency signals similar to the ATOC sound source demonstrated no variation in foraging activity (Croll et al. 2001), whereas five out of six North Atlantic right whales exposed to an acoustic alarm interrupted their foraging dives (Nowacek et al. 2004). Although the received sound pressure level at the animals was similar in the latter two studies, the frequency, duration, and temporal pattern of signal presentation were different. These factors, as well as differences in species sensitivity, are likely contributing factors to the differential response. A determination of whether foraging disruptions incur fitness consequences will require information on or estimates of the energetic requirements of the individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Breathing

Variations in respiration naturally vary with different behaviors and variations in respiration rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Mean exhalation rates of gray whales at rest and while diving were found to be unaffected by seismic surveys conducted adjacent to the whale feeding grounds (Gailey et al. 2007). Studies with captive harbor porpoises showed increased respiration rates upon introduction of acoustic alarms (Kastelein et al. 2000, Kastelein et al. 2006) and emissions for underwater data transmission (Kastelein et al. 2005). However, exposure of the same acoustic alarm to a striped dolphin under the same conditions did not elicit a response (Kastelein et al. 2006), again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure.

Social relationships

Social interactions between mammals can be affected by noise via the disruption of communication signals or by the displacement of individuals. Disruption of social relationships therefore depends on the disruption of other behaviors (e.g., caused avoidance, masking, etc.) and no specific overview is provided here. However, social disruptions must be considered in context of the relationships that are affected. Long-term disruptions of mother/calf pairs or mating displays have the potential to affect the growth and survival or reproductive effort/success of individuals, respectively.

Vocalizations

Vocal changes in response to anthropogenic noise can occur across the repertoire of sound production modes used by marine mammals, such as whistling, echolocation click production, calling, and singing. Changes may result in response to a need to compete with an increase in background noise or may reflect an increased vigilance or startle response. For example, in the presence of low-frequency active sonar, humpback whales have been observed to increase the length of their ”songs” (Miller et al. 2000, Fristrup et al. 2003), possibly due to the overlap in frequencies between the whale song and the low-frequency active sonar. A similar compensatory effect for the presence of low frequency vessel noise has been suggested for right whales; right whales have been observed to shift the frequency content of their calls upward while reducing the rate of calling in areas of increased anthropogenic noise (Parks et al. 2007). Killer whales off the northwestern coast of the United States have been observed to increase the duration of primary calls once a threshold in observing vessel density (e.g., whale watching) was reached, which has been suggested as a response to increased masking noise produced by the vessels (Foote et al. 2004). In contrast, both sperm and pilot whales potentially ceased sound production during the Heard Island feasibility test (Bowles et al. 1994), although it cannot be absolutely determined whether the inability to acoustically detect the animals was due to the cessation of sound production or the displacement of animals from the area.

Avoidance

Avoidance is the displacement of an individual from an area as a result of the presence of a sound. It is qualitatively different from the flight response in its magnitude (i.e., directed movement, rate of travel, etc.). Oftentimes avoidance is temporary, and animals return to the area once the noise has ceased. Longer term displacement is possible, however, which can lead to changes in abundance or distribution patterns of the species in the affected region if they do not become acclimated to the presence of the sound (Blackwell et al. 2004, Bejder et al. 2006, Teilmann et al. 2006). Acute avoidance responses have been observed in captive porpoises and pinnipeds exposed to a number of different sound sources (Kastelein et al. 2000, Finneran et al. 2003, Kastelein et al. 2006). Short term avoidance of seismic surveys, low frequency emissions, and acoustic deterrents has also been noted in wild populations of odontocetes

(Bowles et al. 1994; Goold 1996, 1998; Stone et al. 2000; Morton and Symonds 2002) and to some extent in mysticetes (Gailey et al. 2007), while longer term or repetitive/chronic displacement for some dolphin groups and for manatees has been suggested to be due to the presence of chronic vessel noise (Haviland-Howell et al. 2007, Miksis-Olds et al. 2007).

Orientation

A shift in an animal's resting state or an attentional change via an orienting response represent behaviors that would be considered mild disruptions if occurring alone, and thus are placed at the bottom of the framework behavior list. As previously mentioned, the responses may co-occur with other behaviors; for instance, an animal may initially orient toward a sound source, and then move away from it. Thus, any orienting response should be considered in context of other reactions that may occur.

Life Functions

Proximate Life Functions

Proximate life history functions are the functions that the animal is engaged in at the time of acoustic exposure. The disruption of these functions, and the magnitude of the disruption, is something that must be considered in determining how the ultimate life history functions are affected. Consideration of the magnitude of the effect to each of the proximate life history functions is dependent upon the life stage of the animal. For example, an animal on a breeding ground which is sexually immature will suffer relatively little consequence to disruption of breeding behavior when compared to an actively displaying adult of prime reproductive age.

Ultimate Life Functions

The ultimate life functions are those that enable an animal to contribute to the population (or stock, or species, etc.). The impact to ultimate life functions will depend on the nature and magnitude of the perturbation to proximate life history functions. Depending on the severity of the response to the stressor, acute perturbations may have nominal to profound impacts on ultimate life functions. For example, unit-level use of sonar by a vessel transiting through an area that is utilized for foraging, but not for breeding, may disrupt feeding by exposed animals for a brief period of time. Because of the brevity of the perturbation, the impact to ultimate life functions may be negligible. By contrast, weekly training over a period of years may have a more substantial impact because the stressor is chronic. Assessment of the magnitude of the stress response from the chronic perturbation would require an understanding of how and whether animals acclimate to a specific, repeated stressor and whether chronic elevations in the stress response (e.g., cortisol levels) produce fitness deficits.

The proximate life functions are loosely ordered in decreasing severity of impact. Mortality (survival) has an immediate effect, in that no future reproductive success is feasible and there is no further addition to the population resulting from reproduction. Severe injuries may also lead to reduced survivorship (longevity) and prolonged alterations in behavior. The latter may further affect an animal's overall reproductive success and reproductive effort. Disruptions of breeding have an immediate impact on reproductive effort and may impact reproductive success. The magnitude of the effect will depend on the duration of the disruption and the type of behavior change that was provoked. Disruptions to feeding and migration can affect all of the ultimate life functions; however, the impacts to reproductive effort and success are not likely to be as severe or immediate as those incurred by mortality and breeding disruptions. Taking into account these considerations, it was determined if there were population and species effects.

Regulatory Framework

The MMPA prohibits the unauthorized harassment of marine mammals and provides the regulatory processes for authorization for any such incidental harassment that might occur during an otherwise lawful activity.

The model for estimating potential acoustic effects from ASW training activities on cetacean species makes use of the methodology that was developed in cooperation with the NOAA for the Navy's Draft EIS/OEIS (DoN 2005). Via response comment letter to Undersea Warfare Training Range (USWTR) received from NMFS dated January 30, 2006, NMFS concurred with the use of Energy Flux Density Level (EL) for the determination of physiological effects to marine mammals. Therefore, this methodology is used to estimate the annual exposure of marine mammals that may be considered MMPA Level A harassment or MMPA Level B harassment as a result of temporary, recoverable physiological effects.

In addition, the approach for estimating potential effects from training activities on marine mammal makes use of the comments received and documents associated with previous Navy NEPA documents analyzing Navy training activities (DoN 2008a,b). As a result of these analyses and in consultation with NMFS, this analysis uses a risk function approach to evaluate the potential for non-TTS MMPA Level B harassment from behavioral effects. The risk function is further explained in Section 3.8.6.3.

A number of Navy actions and NOAA rulings have helped to qualify possible events deemed as "harassment" under the MMPA (e.g. DoN 2008a,b). As stated previously, "harassment" under the MMPA includes both potential injury (Level A), and disruptions of natural behavioral patterns to a point where they are abandoned or significantly altered (Level B). NMFS also includes mortality as a possible outcome to consider in addition to MMPA Level A and MMPA Level B harassment. The acoustic effects analysis and exposure calculations are based on the following premises:

Harassment that may result from Navy training activities described in this EIS/OEIS is unintentional and incidental to those activities.

The acoustic effects analysis is based on primary exposures only. Secondary, or indirect, effects, such as susceptibility to predation following injury and injury resulting from disrupted behavior, while possible, can only be reliably predicted in circumstances where the responses have been well documented. Consideration of secondary effects would result in much MMPA Level A harassment being considered MMPA Level B harassment, and vice versa, since much injury (Level A harassment) has the potential to disrupt behavior (Level B harassment), and much temporary physiological or behavioral disruption (Level B) could be conjectured to have the potential for injury (Level A). Consideration of secondary effects would lead to circular definitions of harassment. However, consistent with prior ruling (NOAA 2001a, 2006b), this analysis assumes that MMPA Level A and MMPA Level B do not overlap so as to preclude circular definitions of harassment.

An individual animal predicted to experience simultaneous multiple injuries, multiple disruptions, or both, is counted as a single take (NOAA 2001, 2006b, 2009). NMFS has defined a 24-hour "refresh rate," or amount of time in which an individual can be harassed no more than once. Behavioral harassment, under the risk function presented in this request, uses received SPL over a 24-hour period as the metric for determining the probability of harassment. The Navy has determined that all proposed sonar activities would be shorter than a 24-hour period. Additional model assumptions account for ship movement, make adjustments for multiple ships and make adjustments for the presence of land shadows.

Integration of Regulatory and Biological Frameworks

This section presents a biological framework within which potential effects can be categorized and then related to the existing regulatory framework of injury (MMPA Level A harassment) and behavioral disruption (MMPA Level B harassment). The information presented in this section was used to develop specific numerical exposure thresholds and risk function exposure estimations. Exposure thresholds are combined with sound propagation models and species distribution data to estimate the potential exposures.

Physiological and Behavioral Effects

Sound exposure may affect multiple biological traits of a marine animal; however, the MMPA as amended directs which traits should be used when determining effects. Effects that address injury are considered Level A harassment under MMPA. Effects that address behavioral disruption are considered Level B harassment under MMPA.

The biological framework proposed here is structured according to potential physiological and behavioral effects resulting from sound exposure. The range of effects may then be assessed to determine which qualify as injury or behavioral disturbance under MMPA regulations. Physiology and behavior are chosen over other biological traits because:

- They are consistent with regulatory statements defining harassment by injury and harassment by disturbance.
- They are components of other biological traits that may be relevant.
- They are a more sensitive and immediate indicator of effect.

For example, ecology is not used as the basis of the framework because the ecology of an animal is dependent on the interaction of an animal with the environment. The animal's interaction with the environment is driven both by its physiological function and its behavior, and an ecological impact may not be observable over short periods of observation. Ecological information is considered in the analysis of the effects of individual species.

A "physiological effect" is defined here as one in which the "normal" physiological function of the animal is altered in response to sound exposure. Physiological function is any of a collection of processes ranging from biochemical reactions to mechanical interaction and operation of organs and tissues within an animal. A physiological effect may range from the most significant of impacts (i.e., mortality and serious injury) to lesser effects that would define the lower end of the physiological impact range, such as the noninjurious distortion of auditory tissues. This latter physiological effect is important to the integration of the biological and regulatory frameworks and will receive additional attention in later sections.

A "behavioral effect" is one in which the "normal" behavior or patterns of behavior of an animal are overtly disrupted in response to an acoustic exposure. Examples of behaviors of concern can be derived from the harassment definitions in the MMPA.

In this EIS/OEIS the term "normal" is used to qualify distinctions between physiological and behavioral effects. Its use follows the convention of normal daily variation in physiological and behavioral function without the influence of anthropogenic acoustic sources. As a result, this EIS/OEIS uses the following definitions:

- A **physiological effect** is a variation in an animal's respiratory, endocrine, hormonal, circulatory, neurological, or reproductive activity and processes, beyond the animal's normal range of variability, in response to human activity or to an exposure to a stimulus such as active sonar.
- A **behavioral effect** is a variation in the pattern of an animal's breathing, feeding, resting, migratory, intraspecific behavior (such as reproduction, mating, territorial, rearing, and agonistic behavior), and interspecific beyond the animal's normal pattern of variability in response to human activity or to an exposure to a stimulus such as active sonar.

The definitions of physiological effect and behavioral effect used within this document should not be confused with more global definitions applied to the field of biology or to existing federal law. It is reasonable to expect some physiological effects to result in subsequent behavioral effects. For example, a marine mammal that suffers a severe injury may be expected to alter diving or foraging to the degree that its variation in these behaviors is outside that which is considered normal for the species. If a physiological effect is accompanied by a behavioral effect, the overall effect is characterized as a physiological effect; physiological effects take precedence over behavioral effects with regard to their ordering. This approach provides the most conservative ordering of effects with respect to severity, provides a rational approach to dealing with the overlap of the definitions, and avoids circular arguments.

The severity of physiological effects generally decreases with decreasing sound exposure and/or increasing distance from the sound source. The same generalization does not consistently hold for behavioral effects because they do not depend solely on the received sound level. Behavioral responses also depend on an animal's learned responses, innate response tendencies, motivational state, the pattern of the sound exposure, and the context in which the sound is presented. However, to provide a tractable approach to predicting acoustic effects that is relevant to the terms of behavioral disruption described in the MMPA, it is assumed here that the severities of behavioral effects also decrease with decreasing sound exposure and/or increasing distance from the sound source. Figure 3.8-4 shows the relationship between severity of effects, source distance, and exposure level, as defined in this EIS/OEIS.

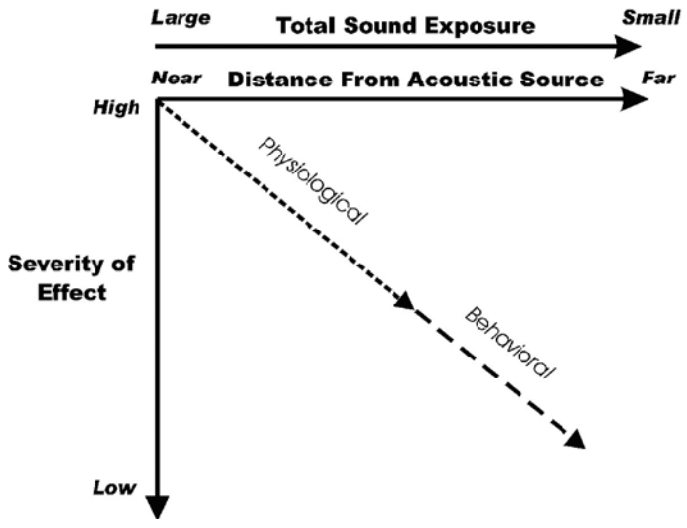


Figure 3.8-4: Relationship between Severity of Effects, Source Distance, and Exposure Level

MMPA Level A Harassment and MMPA Level B Harassment

Categorizing potential effects as either physiological or behavioral effects allows them to be related to the harassment definitions. For military readiness activities, MMPA Level A harassment includes any act that

injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild. Injury, as defined in this EIS/OEIS and previous rulings (NOAA 2001a, 2002, 2008b, 2008c), is the destruction or loss of biological tissue from a species. The destruction or loss of biological tissue will result in an alteration of physiological function that exceeds the normal daily physiological variation of the intact tissue. For example, increased localized histamine production, edema, production of scar tissue, activation of clotting factors, white blood cell response, etc., may be expected following injury. Therefore, this EIS/OEIS assumes that all injury is qualified as a physiological effect and, to be consistent with prior actions and rulings (NOAA 2001a, 2008b, 2008c), all injuries (slight to severe) are considered MMPA Level A harassment.

Public Law 108-136 (2004) amended the MMPA definitions of Level B harassment for military readiness activities, which applies to this action. For military readiness activities, MMPA Level B harassment is defined as "any act that disturbs or is likely to disturb a marine mammal or marine mammal stock by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behaviors are abandoned or significantly altered." Unlike MMPA Level A harassment, which is solely associated with physiological effects, both physiological and behavioral effects may cause MMPA Level B harassment.

For example, some physiological effects (such as TTS) can occur that are non-injurious but that can potentially disrupt the behavior of a marine mammal. These include temporary distortions in sensory tissue that alter physiological function, but that are fully recoverable without the requirement for tissue replacement or regeneration. For example, an animal that experiences a temporary reduction in hearing sensitivity suffers no injury to its auditory system, but may not perceive some sounds due to the reduction in sensitivity. As a result, the animal may not respond to sounds that would normally produce a behavioral reaction. This lack of response qualifies as a temporary disruption of normal behavioral patterns – the animal is impeded from responding in a normal manner to an acoustic stimulus.

The harassment status of slight behavior disruption has been addressed in workshops, previous actions, and rulings (NOAA 2001a, 2008b, 2008c; DoN 2001a). The conclusion is that a momentary behavioral reaction of an animal to a brief, time-isolated acoustic event does not qualify as MMPA Level B harassment. A more general conclusion, that MMPA Level B harassment occurs only when there is "a potential for a significant behavioral change or response in a biologically important behavior or activity," is found in recent rulings (NOAA 2002, 2008b, 2008c). Public Law 108-136 (2004) amended the definition of MMPA Level B harassment for military readiness activities, which applies to this action. For military readiness activities, MMPA Level B harassment is defined as "any act that disturbs or is likely to disturb a marine mammal or marine mammal stock by causing disruption of natural behavioral patterns…to a point where such behaviors are abandoned or significantly altered."

Although the temporary lack of response discussed above may not result in abandonment or significant alteration of natural behavioral patterns, the acoustic effect inputs used in the acoustic model assume that temporary hearing impairment (slight to severe) is considered MMPA Level B harassment. Although modes of action are appropriately considered, as outlined in Figure 3.8-5, the conservative assumption used here is to consider all hearing impairment as harassment from TTS. As a result, the actual incidental harassment of marine mammals associated with this action may be less than predicted via the analytical framework.

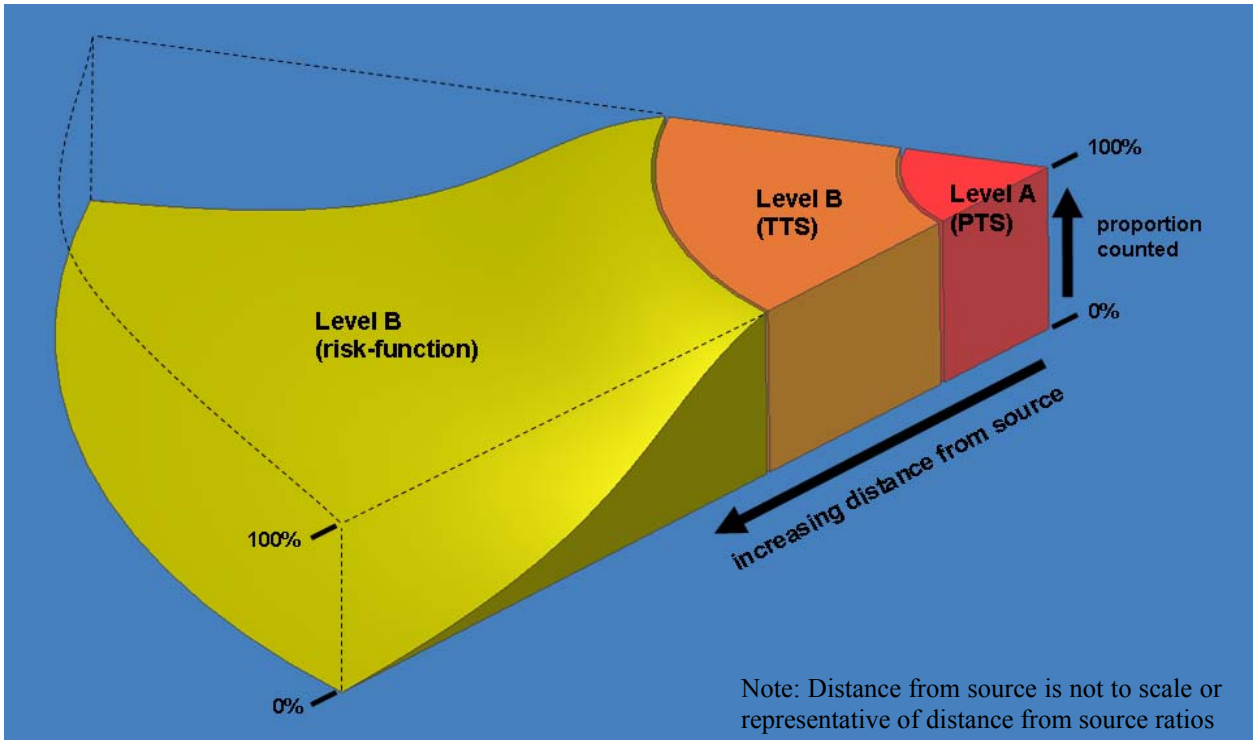


Figure 3.8-5: Exposure Zones Extending from a Hypothetical, Directional Sound Source

MMPA Exposure Zones

Two acoustic modeling approaches are used to account for both physiological and behavioral effects to marine mammals. When using a threshold of accumulated energy (EL) the volumes of ocean in which MMPA Level A and MMPA Level B harassment from a Threshold Shift (TS) are predicted to occur are described as exposure zones. As a conservative estimate, all marine mammals predicted to be in a zone are considered exposed to accumulated sound levels that may result in harassment within the applicable MMPA Level A (PTS) or MMPA Level B (TTS) harassment categories. MMPA non-TTS Level B (risk-function) is not derived from EL, but is an estimate of the probability of non-TTS behavioral responses that NMFS would classify as harassment. See Section 3.8.6.3 for a thorough description of the risk function methodology. Figure 3.8-5 illustrates harassment zones extending from a hypothetical, directional sound source and is for illustrative purposes only and does not represent the sizes or shapes of the actual exposure zones.

As depicted in Figure 3.8-5, the red MMPA Level A (PTS) exposure zone extends from the source out to the distance and exposure at which the slightest amount of injury is predicted to occur (a distance of approximately 33 ft [10 m] from a SQS-53 sonar in the TMAA). The acoustic exposure that produces the slightest degree of injury is therefore the threshold value defining the outermost limit of the MMPA Level A exposure zone. Use of the threshold associated with the onset of slight injury as the most distant point and least injurious exposure takes account of all more serious injuries by inclusion within the MMPA Level A harassment zone.

The orange MMPA Level B (TTS) exposure zone begins just beyond the point of slightest injury (33 ft [10 m]) and extends outward from that point to include all animals that may possibly experience MMPA Level B harassment from TTS (a distance of approximately 584 ft [178 m] from an SQS-53 sonar in the TMAA). Physiological effects extend beyond the range of slightest injury to a point where slight

temporary distortion of the most sensitive tissue occurs, but without destruction or loss of that tissue (such as occurs with inner ear hair cells subjected to TTS). The animals predicted to be in this zone are assumed to experience MMPA Level B harassment from TTS by virtue of temporary impairment of sensory function (altered physiological function) that can disrupt behavior. The criterion and threshold used to define the outer limit of the MMPA Level B exposure zone for the on-set of certain physiological effects are given in Figure 3.8-5.

On Figure 3.8-5 in the yellow non-TTS MMPA Level B harassment exposure zone, varying percentages of exposed animals would be included under MMPA Level B harassment from behavioral reactions (to a distance of approximately 105 km [57 nm] from a SQS-53 in the TMAA).

Auditory Tissues as Indicators of Physiological Effects

Exposure to continuous-type sound may cause a variety of physiological effects in mammals. For example, exposure to very high sound levels may affect the function of the visual system, vestibular system, and internal organs (Ward, 1997). Exposure to high-intensity, continuous type sounds of sufficient duration may cause injury to the lungs and intestines (e.g., Dalecki et al. 2002). Sudden, intense sounds may elicit a "startle" response and may be followed by an orienting reflex (Ward 1997, Jansen 1998). The primary physiological effects of sound, however, are on the auditory system (Ward 1997).

The mammalian auditory system consists of the outer ear, middle ear, inner ear, and central nervous system. Sound waves are transmitted through the middle ears to fluids within the inner ear except cetaceans. The inner ear contains delicate electromechanical hair cells that convert the fluid motions into neural impulses that are sent to the brain. The hair cells within the inner ear are the most vulnerable to over-stimulation by sound exposure (Yost 1994).

Very high sound levels may rupture the eardrum or damage the small bones in the middle ear (Yost 1994). Lower level exposures of sufficient duration may cause permanent or temporary hearing loss; such an effect is called a noise-induced threshold shift, or simply a TS (Miller 1974). A TS may be either permanent, in which case it is called a PTS, or temporary, in which case it is called a TTS. Still lower levels of sound may result in auditory masking (described in Section 3.8.6.2), which may interfere with an animal's ability to hear other concurrent sounds.

Because the tissues of the ear appear to be the most susceptible to the physiological effects of sound and TSs tend to occur at lower exposures than other more serious auditory effects, PTS and TTS are used here as the biological indicators of physiological effects. TTS is the first indication of physiological noninjurious change and is not physical injury. The remainder of this section is, therefore, focused on TSs, including PTSs and TTSs. Since masking (without a resulting TS) is not associated with abnormal physiological function, it is not considered a physiological effect in this EIS/OEIS, but rather a potential behavioral effect. Descriptions of other potential physiological effects, including acoustically mediated bubble growth and air cavity resonance, are described in the Appendix F.

Noise-Induced Threshold Shifts

The amount of TS depends on the amplitude, duration, frequency, and temporal pattern of the sound exposure. Threshold shifts will generally increase with the amplitude and duration of sound exposure. For continuous sounds, exposures of equal energy will lead to approximately equal effects (Ward 1997). For intermittent sounds, less TS will occur than from a continuous exposure with the same energy (some recovery will occur between exposures) (Kryter et al. 1966, Ward 1997).

The magnitude of a TS normally decreases with the amount of time post-exposure (Miller, 1974). The amount of TS just after exposure is called the initial TS. If the TS eventually returns to zero (the threshold

returns to the pre-exposure value), the TS is a TTS. Since the amount of TTS depends on the time post-exposure, it is common to use a subscript to indicate the time in min after exposure (Quaranta et al. 1998). For example, TTS_2 means a TTS measured 2 min after exposure. If the TS does not return to zero but leaves some finite amount of TS, then that remaining TS is a PTS. The distinction between PTS and TTS is based on whether there is a complete recovery of a TS following a sound exposure. Figure 3.8-6 shows two hypothetical TSs: one that completely recovers, a TTS, and one that does not completely recover, leaving some PTS.

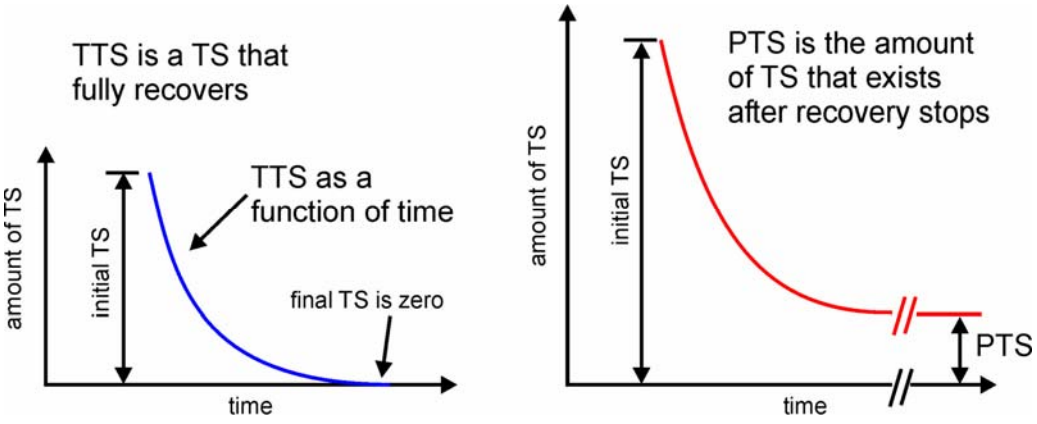


Figure 3.8-6: Hypothetical Temporary and Permanent Threshold Shifts

PTS, TTS, and Exposure Zones

PTS is non-recoverable and, by definition, must result from the destruction of tissues within the auditory system. PTS therefore qualifies as an injury and is classified as Level A harassment under the wording of the MMPA. In the TMAA, the smallest amount of PTS (onset- PTS) is taken to be the indicator for the smallest degree of injury that can be measured. The acoustic exposure associated with onset-PTS is used to define the outer limit of the MMPA Level A exposure zone.

TTS is recoverable and, as in recent rulings (NOAA 2001a, 2002a, 2009), is considered to result from the temporary, non-injurious distortion of hearing-related tissues. In the TMAA, the smallest measurable amount of TTS (onset-TTS) is taken as the best indicator for slight temporary sensory impairment. Because it is considered non-injurious, the acoustic exposure associated with onset-TTS is used to define the outer limit of the portion of the MMPA Level B exposure zone attributable to physiological effects. This follows from the concept that hearing loss potentially affects an animal's ability to react normally to the sounds around it. Therefore, in the TMAA, the potential for TTS is considered as a MMPA Level B harassment that is mediated by physiological effects on the auditory system.

Criteria and Thresholds for Physiological Effects (Sensory Impairment)

This section presents the effect criteria and thresholds for physiological effects of sound leading to injury and behavioral disturbance as a result of sensory impairment. Tissues of the ear are the most susceptible to physiological effects of underwater sound. PTS and TTS were determined to be the most appropriate biological indicators of physiological effects that equate to the onset of injury (Level A harassment) and behavioral disturbance (Level B harassment from TTS), respectively. This section is, therefore, focused on criteria and thresholds to predict PTS and TTS in marine mammals.

Marine mammal ears are functionally and structurally similar to terrestrial mammal ears; however, there are important differences (Ketten 1998). The most appropriate information from which to develop

PTS/TTS criteria for marine mammals would be experimental measurements of PTS and TTS from marine mammal species of interest. TTS data exist for several marine mammal species and may be used to develop meaningful TTS criteria and thresholds. Because of the ethical issues presented, PTS data do not exist for marine mammals and are unlikely to be obtained. Therefore, PTS criteria must be extrapolated using TTS criteria and estimates of the relationship between TTS and PTS.

This section begins with a review of the existing marine mammal TTS data. The review is followed by a discussion of the relationship between TTS and PTS. The specific criteria and thresholds for TTS and PTS used in this EIS/OEIS are then presented. This is followed by discussions of sound energy flux density level (EL), the relationship between EL and SPL, and the use of SPL and EL in previous environmental compliance documents.

EL and SPL

EL is measure of the sound energy flow per unit area expressed in dB. EL is stated in dB re 1 μPa^2-s for underwater sound and dB re $(20\ \mu Pa)^2$-s for airborne sound.

SPL is a measure of the root-mean square (rms), or "effective," sound pressure in decibels. SPL is expressed in dB re 1 µPa for underwater sound and dB re 20 µPa for airborne sound.

TTS in Marine Mammals

A number of investigators have measured TTS in marine mammals. These studies measured hearing thresholds in trained marine mammals before and after exposure to intense sounds. Some of the more important data obtained from these studies are onset-TTS levels – exposure levels sufficient to cause a just-measurable amount of TTS, often defined as 6 dB of TTS (for example, Schlundt et al. 2000). The existing cetacean and pinniped underwater TTS data are summarized in the following bullets.

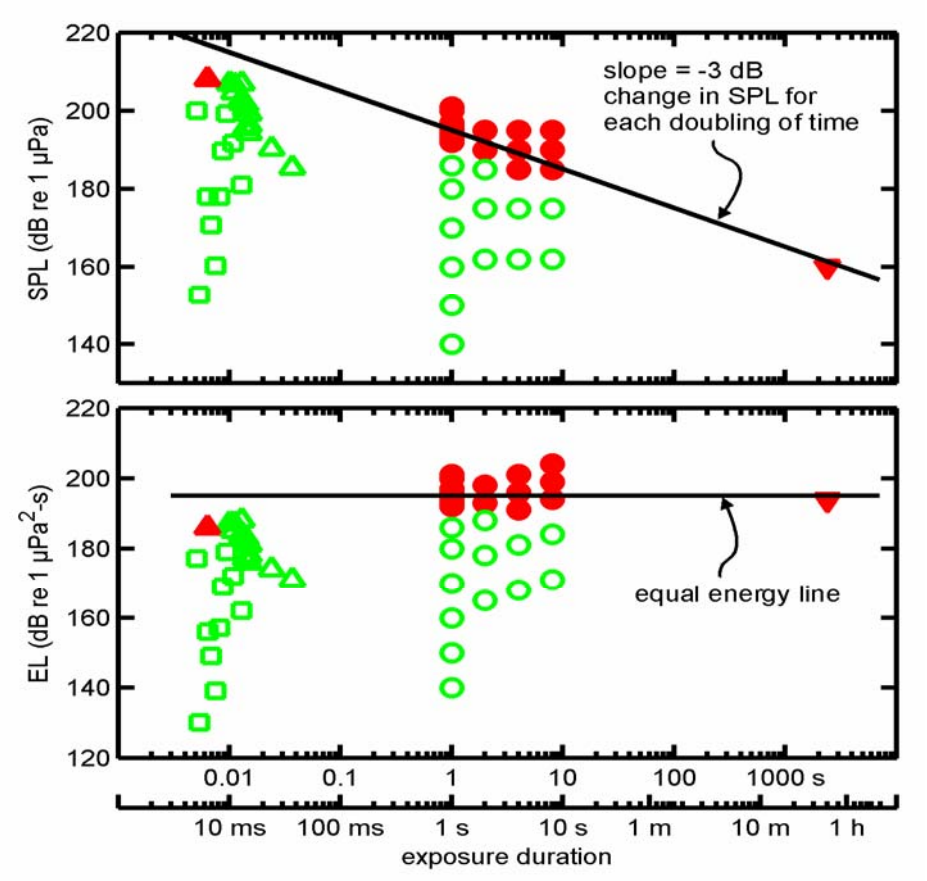
- Schlundt et al. (2000) reported the results of TTS experiments conducted with bottlenose dolphins and white whales exposed to 1-second tones. This paper also includes a reanalysis of preliminary TTS data released in a technical report by Ridgway et al. (1997). At frequencies of 3, 10, and 20 kHz, SPLs necessary to induce measurable amounts (6 dB or more) of TTS were between 192 and 201 dB re 1 µPa (EL = 192 to 201 dB re 1 μPa^2-s). The mean exposure SPL and EL for onset-TTS were 195 dB re 1 µPa and 195 dB re 1 μPa^2-s, respectively. The sound exposure stimuli (tones) and relatively large number of test subjects (five dolphins and two white whales) make the Schlundt et al. (2000) data the most directly relevant TTS information for the scenarios described in this EIS/OEIS.
- Finneran et al. (2001, 2003, 2005) described TTS experiments conducted with bottlenose dolphins exposed to 3-kHz tones with durations of 1, 2, 4, and 8 seconds. Small amounts of TTS (3 to 6 dB) were observed in one dolphin after exposure to ELs between 190 and 204 dB re 1 μPa^2-s. These results were consistent with the data of Schlundt et al. (2000) and showed that the Schlundt et al. (2000) data were not significantly affected by the masking sound used. These results also confirmed that, for tones with different durations, the amount of TTS is best correlated with the exposure EL rather than the exposure SPL.
- Finneran et al. (2007) conducted TTS experiments with bottlenose dolphins exposed to intense 20 kHz fatiquing tone. Behavioral and auditory evoked potentials (using sinusoidal amplitude modulated tones creating auditory steady state response [AASR]) were used to measure TTS. The fatiguing tone was either 16 (mean = 193 re 1µPa, SD = 0.8) or 64 seconds (185-186 re 1µPa) in duration. TTS ranged from 19-33db from behavioral measurements and 40-45dB from ASSR measurements.

- Nachtigall et al. (2003) measured TTS in a bottlenose dolphin exposed to octave-band sound centered at 7.5 kHz. Nachtigall et al. (2003) reported TTSs of about 11 dB measured 10 to 15 min after exposure to 30 to 50 min of sound with SPL 179 dB re 1 µPa (EL about 213 dB re µPa^2-s). No TTS was observed after exposure to the same sound at 165 and 171 dB re 1 µPa. Nachtigall et al. (2003) reported TTSs of around 4 to 8 dB 5 min after exposure to 30 to 50 min of sound with SPL 160 dB re 1 µPa (EL about 193 to 195 dB re 1 µPa^2-s). The difference in results was attributed to faster post-exposure threshold measurement—TTS may have recovered before being detected by Nachtigall et al. (2003). These studies showed that, for long-duration exposures, lower sound pressures are required to induce TTS than are required for short-duration tones. These data also confirmed that, for the cetaceans studied, EL is the most appropriate predictor for onset-TTS.
- Finneran et al. (2000, 2002) conducted TTS experiments with dolphins and white whales exposed to impulsive sounds similar to those produced by distant at-sea explosions and seismic water guns. These studies showed that, for very short-duration impulsive sounds, higher sound pressures were required to induce TTS than for longer-duration tones.
- Kastak et al. (1999, 2005) conducted TTS experiments with three species of pinnipeds, California sea lion, northern elephant seal and a Pacific harbor seal, exposed to continuous underwater sounds at levels of 80 and 95 dB Sensation Level (referenced to the animal's absolute auditory threshold at the center frequency) at 2.5 and 3.5 kHz for up to 50 min. Mean TTS shifts of up to 12.2 dB occurred with the harbor seals showing the largest shift of 28.1 dB. Increasing the sound duration had a greater effect on TTS than increasing the sound level from 80 to 95 dB.

Figure 3.8-7 shows the existing TTS data for cetaceans (dolphins and white whales). Individual exposures are shown in terms of SPL versus exposure duration (upper panel) and EL versus exposure duration (lower panel). Exposures that produced TTS are shown as filled symbols. Exposures that did not produce TTS are represented by open symbols. The squares and triangles represent impulsive test results from Finneran et al. 2000 and 2002, respectively. The circles show the 3-, 10-, and 20-kHz data from Schlundt et al. (2000) and the results of Finneran et al. (2003). The inverted triangle represents data from Nachtigall et al. (2003).

Figure 3.8-7 illustrates that the effects of the different sound exposures depend on the SPL and duration. As the duration decreases, higher SPLs are required to cause TTS. In contrast, the ELs required for TTS do not show the same type of variation with exposure duration. At this time the raw data for pinnipeds is not available to construct a similar graph of TTS in pinnipeds as there is for cetaceans in Figure 3.8-7.

The solid line in the upper panel of Figure 3.8-7 has a slope of -3 dB per doubling of time. This line passes through the point where the SPL is 195 dB re 1 µPa and the exposure duration is 1 second. Since EL = SPL + 10log10 (duration), doubling the duration increases the EL by 3 dB. Subtracting 3 dB from the SPL decreases the EL by 3 dB. The line with a slope of -3 dB per doubling of time, therefore, represents an equal energy line – all points on the line have the same EL, which is, in this case, 195 dB re 1 µPa^2-s. This line appears in the lower panel as a horizontal line at 195 dB re 1 µPa^2-s. The equal energy line at 195 dB re 1 µPa^2-s fits the tonal and sound data (the nonimpulsive data) very well, despite differences in exposure duration, SPL, experimental methods, and subjects.



Legend: Filled symbol: Exposure that produced TTS, Open symbol: Exposure that did not produce TTS Squares: Impulsive test results from Finneran et al. 2000, Triangles: Impulsive test results from Finneran et al. 2002, Circles: 3, 10, and 20-kHz data from Schlundt et al. (2000) and results of Finneran et al. (2003), and Inverted triangle: Data from Nachtigall et al. 2004.

Figure 3.8-7: Existing TTS Data for Cetaceans

In summary, the existing cetacean TTS data show that, for the species studied and sounds (nonimpulsive) of interest, the following is true:

- The growth and recovery of TTS are analogous to those in land mammals. This means that, as in land mammals, cetacean TSs depend on the amplitude, duration, frequency content, and temporal pattern of the sound exposure. Threshold shifts will generally increase with the amplitude and duration of sound exposure. For continuous sounds, exposures of equal energy will lead to approximately equal effects (Ward 1997). For intermittent sounds, less TS will occur than from a continuous exposure with the same energy (some recovery will occur between exposures) (Kryter et al. 1966, Ward 1997).
- SPL by itself is not a good predictor of onset-TTS, since the amount of TTS depends on both SPL and duration.
- Exposure EL is correlated with the amount of TTS and is a good predictor for onset-TTS for single, continuous exposures with different durations. This agrees with human TTS data presented by Ward et al. (1958, 1959).
- An energy flux density level of 195 dB re 1 μPa^2-s is the most appropriate predictor for onset-TTS from a single, continuous exposure.

- For the purposes of this EIS/OEIS a measurable amount of 6 dB is considered the onset of TTS.

Relationship between TTS and PTS

Since marine mammal PTS data do not exist, onset-PTS levels for these animals must be estimated using TTS data and relationships between TTS and PTS. Much of the early human TTS work was directed towards relating TTS_2 after 8 hours of sound exposure to the amount of PTS that would exist after years of similar daily exposures (e.g., Kryter et al. 1966). Although it is now acknowledged that susceptibility to PTS cannot be reliably predicted from TTS measurements, TTS data do provide insight into the amount of TS that may be induced without a PTS. Experimental studies of the growth of TTS may also be used to relate changes in exposure level to changes in the amount of TTS induced. Onset-PTS exposure levels may therefore be predicted by:

- Estimating the largest amount of TTS that may be induced without PTS. Exposures causing a TS greater than this value are assumed to cause PTS.
- Estimating the additional exposure, above the onset-TTS exposure, necessary to reach the maximum allowable amount of TTS that, again, may be induced without PTS. This is equivalent to estimating the growth rate of TTS – how much additional TTS is produced by an increase in exposure level.

Experimentally induced TTSs, from short duration sounds 1-8 seconds in the range of 3.5-20 kHz, in marine mammals have generally been limited to around 2 to 10 dB, well below TSs that result in some PTS. Experiments with terrestrial mammals have used much larger TSs and provide more guidance on how high a TS may rise before some PTS results. Early human TTS studies reported complete recovery of TTSs as high as 50 dB after exposure to broadband sound (Ward 1960; Ward et al. 1958, 1959). Ward et al. (1959) also reported slower recovery times when TTS_2 approached and exceeded 50 dB, suggesting that 50 dB of TTS_2 may represent a "critical" TTS. Miller et al. (1963) found PTS in cats after exposures that were only slightly longer in duration than those causing 40 dB of TTS. Kryter et al. (1966) stated: "A TTS_2 that approaches or exceeds 40 dB can be taken as a signal that danger to hearing is imminent." These data indicate that TSs up to 40 to 50 dB may be induced without PTS, and that 40 dB is a reasonable upper limit for TS to prevent PTS.

The small amounts of TTS produced in marine mammal studies also limit the applicability of these data to estimates of the growth rate of TTS. Fortunately, data do exist for the growth of TTS in terrestrial mammals. For moderate exposure durations (a few min to hours), TTS_2 varies with the logarithm of exposure time (Ward et al. 1958, 1959; Quaranta et al. 1998). For shorter exposure durations the growth of TTS with exposure time appears to be less rapid (Miller 1974, Keeler 1976). For very long-duration exposures, increasing the exposure time may fail to produce any additional TTS, a condition known as asymptotic threshold shift (Saunders et al. 1977, Mills et al. 1979).

Ward et al. (1958, 1959) provided detailed information on the growth of TTS in humans. Ward et al. (1958, 1959) presented the amount of TTS measured after exposure to specific SPLs and durations of broadband sound. Since the relationship between EL, SPL, and duration is known, these same data could be presented in terms of the amount of TTS produced by exposures with different ELs.

Figure 3.8-8 shows results from Ward et al. (1958, 1959) plotted as the amount of TTS_2 versus the exposure EL. The data in Figure 3.8-8 (a) are from broadband (75 Hz to 10 kHz) sound exposures with durations of 12 to 102 min (Ward et al. 1958). The symbols represent mean TTS_2 for 13 individuals exposed to continuous sound. The solid line is a linear regression fit to all but the two data points at the lowest exposure EL. The experimental data are fit well by the regression line (R2 = 0.95). These data are important for two reasons: (1) they confirm that the amount of TTS is correlated with the exposure EL; and (2) the slope of the line allows one to estimate the in additional amount of TTS produced by an

increase in exposure. For example, the slope of the line in Figure 3.8-8 (a) is approximately 1.5 dB TTS_2 per dB of EL. This means that each additional dB of EL produces 1.5 dB of additional TTS_2.

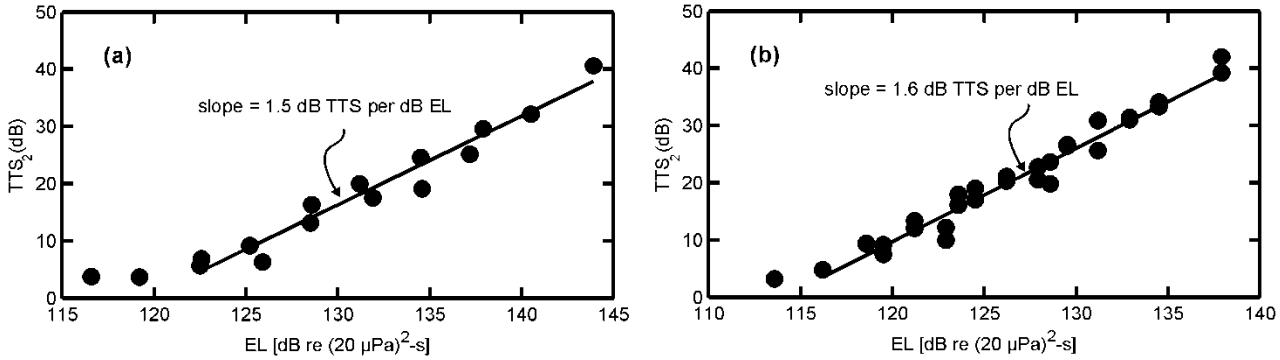


Figure 3.8-8: Growth of TTS versus the Exposure EL (from Ward et al. [1958, 1959])

The data in Figure 3.8-8 (b) are from octave-band sound exposures (2.4 to 4.8 kHz) with durations of 12 to 102 min (Ward et al. 1959). The symbols represent mean TTS for 13 individuals exposed to continuous sound. The linear regression was fit to all but the two data points at the lowest exposure EL. The slope of the regression line fit to the mean TTS data was 1.6 dB TTS_2/dB EL. A similar procedure was carried out for the remaining data from Ward et al. (1959), with comparable results. Regression lines fit to the TTS versus EL data had slopes ranging from 0.76 to 1.6 dB TTS_2/dB EL, depending on the frequencies of the sound exposure and hearing test.

An estimate of 1.6 dB TTS2 per dB increase in exposure EL is the upper range of values from Ward et al. (1958, 1959) and gives the most conservative estimate – it predicts a larger amount of TTS from the same exposure compared to the lines with smaller slopes. The difference between onset-TTS (6 dB) and the upper limit of TTS before PTS (40 dB) is 34 dB. To move from onset-TTS to onset-PTS, therefore, requires an increase in EL of 34 dB divided by 1.6 dB/dB, or approximately 21 dB. An estimate of 20 dB between exposures sufficient to cause onset-TTS and those capable of causing onset-PTS is a reasonable approximation.

To summarize:

In the absence of marine mammal PTS data, onset-PTS exposure levels may be estimated from marine mammal TTS data and PTS/TTS relationships observed in terrestrial mammals. This involves:

- Estimating the largest amount of TTS that may be induced without PTS. Exposures causing a TS greater than this value are assumed to cause PTS.
- Estimating the growth rate of TTS – how much additional TTS is produced by an increase in exposure level.
- A variety of terrestrial mammal data sources point toward 40 dB as a reasonable estimate of the largest amount of TS that may be induced without PTS. A conservative is that continuous-type exposures producing TSs of 40 dB or more always result in some amount of PTS.
- Data from Ward et al. (1958, 1959) reveal a linear relationship between TTS_2 and exposure EL. A value of 1.6 dB TTS_2 per dB increase in EL is a conservative estimate of how much additional TTS is produced by an increase in exposure level for continuous- type sounds.

- There is a 34 dB TS difference between onset-TTS (6 dB) and onset-PTS (40 dB). The additional exposure above onset-TTS that is required to reach PTS is therefore 34 dB divided by 1.6 dB/dB, or approximately 21 dB.
- Exposures with ELs 20 dB above those producing TTS may be assumed to produce a PTS. This number is used as a conservative simplification of the 21 dB number derived above.

Threshold Levels for Harassment from Physiological Effects

For this specified action, sound exposure thresholds for modeling TTS and PTS exposures are as presented in Table 3.8-4.

Table 3.8-4: Summary of the Physiological Effects Thresholds for TTS and PTS for Cetaceans and Pinnipeds in the TMAA

Species	Criteria	Threshold (dB re 1μPa^2-s)	MMPA Harassment
Cetaceans All species	TTS PTS	195 215	Level B Level A
Pinniped			
California Sea Lion	TTS PTS	206 226	Level B Level A
Northern Elephant Seal	TTS PTS	204 224	Level B Level A
Northern Fur Seal	TTS PTS	206 226	Level B Level A
Steller Sea Lion	TTS PTS	206 226	Level B Level A

Notes: dB re 1μPa^2-s = decibels referenced to 1 micropascal squared per second, MMPA = Marine Mammal Protection Act, PTS = Permanent Threshold Shift, TTS = Temporary Threshold Shift

Cetaceans predicted to receive a sound exposure with EL of 215 dB re 1 μPa^2-s or greater are assumed to experience PTS and are counted as MMPA Level A harassment. Cetaceans predicted to receive a sound exposure with EL greater than or equal to 195 dB re 1 μPa^2-s but less than 215 dB re 1 μPa^2-s are assumed to experience TTS and are counted as MMPA Level B harassment from TTS.

The TTS and PTS thresholds for pinnipeds vary with species. A threshold of 206 dB re 1 μPa^2-s for TTS and 226 dB re 1 μPa^2-s for PTS is used for otariids (California sea lion, Steller sea lion, and Northern fur seal). Although this criteria is based on data from studies on California sea lions (Kastak et al. 1999, 2005), all three species are morphologically related (e.g., similar body structure and anatomy), and have similar breeding and foraging behaviors. Northern elephant seals are similar to otariids and use thresholds of TTS = 204 dB re 1 μPa^2-s, PTS = 224 dB re 1 μPa^2-s. A lower threshold is used for harbor seals (TTS = 183 dB re 1 μPa^2-s, PTS = 203 dB re 1 μPa^2-s).

Derivation of Effect Threshold

Cetacean Threshold

The TTS threshold is primarily based on the cetacean TTS data from Schlundt et al. (2000). Since these tests used short-duration tones similar to sonar pings, they are the most directly relevant data. The mean exposure EL required to produce onset-TTS in these tests was 195 dB re 1 μPa^2-s. This result is corroborated by the short-duration tone data of Finneran et al. (2001, 2003, 2005) and the long-duration sound data from Nachtigall et al. (2003). Together, these data demonstrate that TTS in cetaceans is

correlated with the received EL and that onset-TTS exposures are fit well by an equal-energy line passing through 195 dB re 1 μPa^2-s.

The PTS threshold is based on a 20-dB increase in exposure EL over that required for onset-TTS. The 20-dB value is based on estimates from terrestrial mammal data of PTS occurring at 40 dB or more of TS, and on TS growth occurring at a rate of 1.6 dB/dB increase in exposure EL. This is conservative because: (1) 40 dB of TS is actually an upper limit for TTS used to approximate onset-PTS, and (2) the 1.6 dB/dB growth rate is the highest observed in the data from Ward et al. (1958, 1959).

Pinniped Threshold

The TTS threshold for pinnipeds is based on TTS data from Kastak et al. (1999, 2005). Although their data is from continuous noise rather than short duration tones, pinniped TTS can be extrapolated using equal energy curves. Continuous sound at a lower intensity level can produce TTS similar to short duration but higher intensity sounds such as sonar pings.

Use of EL for Physiological Effect Thresholds

Effect thresholds are expressed in terms of total received EL. Energy flux density is a measure of the flow of sound energy through an area. Marine and terrestrial mammal data show that, for continuous-type sounds of interest, TTS and PTS are more closely related to the energy in the sound exposure than to the exposure SPL.

The EL for each individual ping is calculated from the following equation:

$$EL = SPL + 10\log_{10}(\text{duration})$$

The EL includes both the ping SPL and duration. Longer-duration pings and/or higher-SPL pings will have a higher EL.

If an animal is exposed to multiple pings, the energy flux density in each individual ping is summed to calculate the total EL. Since mammalian TS data show less effect from intermittent exposures compared to continuous exposures with the same energy (Ward 1997), basing the effect thresholds on the total received EL is a conservative approach for treating multiple pings; in reality, some recovery will occur between pings and lessen the effect of a particular exposure.

Therefore, estimates are conservative because recovery is not taken into account – intermittent exposures are considered comparable to continuous exposures.

The total EL depends on the SPL, duration, and number of pings received. The TTS and PTS thresholds do not imply any specific SPL, duration, or number of pings. The SPL and duration of each received ping are used to calculate the total EL and determine whether the received EL meets or exceeds the effect thresholds. For example, the TTS threshold would be reached through any of the following exposures:

- A single ping with SPL = 195 dB re 1 µPa and duration = 1 second.
- A single ping with SPL = 192 dB re 1 µPa and duration = 2 seconds.
- Two pings with SPL = 192 dB re 1 µPa and duration = 1 second.
- Two pings with SPL = 189 dB re 1 µPa and duration = 2 seconds.

Previous Use of EL for Physiological Effects

Originally for effects criteria from at-sea (underwater) explosions, energy measures were part of dual criteria for cetacean auditory effects in ship shock trials, which only involve impulsive-type sounds (DoN 1997, 2001a). These previous actions used 192 dB re 1 μPa^2-s as a reference point to derive a TTS threshold in terms of EL. A second TTS threshold, based on peak pressure, was also used. If either threshold was exceeded, effect was assumed.

The 192 dB re 1 μPa^2-s reference point differs from the threshold of 195 dB re 1 μPa^2-s used in this EIS/OEIS. The 192 dB re 1 μPa^2-s value was based on the minimum observed by Ridgway et al. (1997) and Schlundt et al. (2000) during TTS measurements with bottlenose dolphins exposed to 1-second tones. At the time, no impulsive test data for marine mammals were available and the 1-second tonal data were considered to be the best available. The minimum value of the observed range of 192 to 201 dB re 1 μPa^2-s was used to protect against misinterpretation of the sparse data set available. The 192 dB re 1 μPa^2-s value was reduced to 182 dB re 1 μPa^2-s to accommodate the potential effects of pressure peaks in impulsive waveforms.

The additional data now available for onset-TTS in small cetaceans confirm the original range of values and increase confidence in it (Finneran et al. 2001, 2003; Nachtigall et al. 2003). This EIS/OEIS therefore, uses the more complete data available and the mean value of the entire Schlundt et al. (2000) data set (195 dB re 1 μPa^2-s), instead of the minimum of 192 dB re 1 μPa^2-s. Use of the data in this manner has been established as standard by NMFS for these types of actions in other Navy training locations in the Pacific (NOAA 2009). From the standpoint of statistical sampling and prediction theory, the mean is the most appropriate predictor—the "best unbiased estimator"—of the EL at which onset-TTS should occur; predicting the number of exposures in future actions relies (in part) on using the EL at which onset-TTS will most likely occur. When that EL is applied over many pings in each of many sonar exercises, that value will provide the most accurate prediction of the actual number of exposures by onset-TTS over all of those exercises. Use of the minimum value would overestimate the number of exposures because many animals counted would not have experienced onset-TTS. Further, there is no logical limiting minimum value of the distribution that would be obtained from continued successive testing. Continued testing and use of the minimum would produce more and more erroneous estimates.

Criteria and Thresholds for Level B Harassment from Non-TTS

This Section presents the effect criterion and threshold for non-TTS behavioral effects of sound leading to behavioral disturbance without accompanying physiological effects as has been established by NMFS (NOAA 2009). Since TTS is used as the biological indicator for a physiological effect leading to behavioral disturbance, the non-TTS behavioral effects discussed in this section may be thought of as behavioral disturbance occurring at exposure levels below those causing TTS.

A large body of research on terrestrial animal and human response to airborne sound exists, but results from those studies are not readily extendible to the development of effect criteria and thresholds for marine mammals. For example, "annoyance" is one of several criteria used to define impact to humans from exposure to industrial sound sources. Comparable criteria cannot be developed for marine mammals because there is no acceptable method for determining whether a nonverbal animal is annoyed. Further, differences in hearing thresholds, dynamic range of the ear, and the typical exposure patterns of interest (e.g., human data tend to focus on 8-hour-long exposures) make extrapolation of human sound exposure standards inappropriate.

Behavioral observations of marine mammals exposed to anthropogenic sound sources exist; however, there are few observations and no controlled measurements of behavioral disruption of cetaceans caused by sound sources with frequencies, waveforms, durations, and repetition rates comparable to those

employed by the tactical sonars to be used in the TMAA. At the present time there is no consensus on how to account for behavioral effects on marine mammals exposed to continuous-type sounds (NRC, 2003b).

3.8.7.4 Assessing MMPA Level B Non-TTS Behavioral Harassment Using Risk Function

Background

Based on available evidence, marine animals are likely to exhibit any of a suite of potential behavioral responses or combinations of behavioral responses upon exposure to sonar transmissions. Potential behavioral responses include, but are not limited to: avoiding exposure or continued exposure; behavioral disturbance (including distress or disruption of social or foraging activity); habituation to the sound; becoming sensitized to the sound; or not responding to the sound.

Existing studies of behavioral effects of human-made sounds in marine environments remain inconclusive, partly because many of those studies have lacked adequate controls, applied only to certain kinds of exposures (which are often different from the exposures being analyzed in the study), and had limited ability to detect behavioral changes that may be significant to the biology of the animals that were being observed. These studies are further complicated by the wide variety of behavioral responses marine mammals exhibit and the fact that those responses can vary significantly by species, individual, and the context of an exposure. In some circumstances, some individuals will continue normal behavioral activities in the presence of high levels of human-made noise. In other circumstances, the same individual or other individuals may avoid an acoustic source at much lower received levels (Richardson et al. 1995, Wartzok et al. 2003). These differences within and between individuals appear to result from a complex interaction of experience, motivation, and learning that are difficult to quantify and predict.

It is possible that some marine mammal behavioral reactions to anthropogenic sound may result in strandings. As detailed in Appendix F, several "mass stranding" events—strandings that involve two or more individuals of the same species (excluding a single cow–calf pair)—that have occurred over the past two decades have been associated with naval training activities, seismic surveys, and other anthropogenic activities that introduced sound into the marine environment. Based on the results of recent experiments with tagged beaked whales, it has been suggested that that beaked whales may be "particularly sensitive to anthropogenic sounds, but there is no evidence that they have a special sensitivity to sonar compared with other signals" (Tyack 2009). Sonar exposure has, however, been identified as a contributing cause or factor in five specific mass stranding events: Greece in 1996; the Bahamas in March 2000; Madeira, Portugal in 2000; the Canary Islands in 2002, and Spain in 2006 (Advisory Committee on Acoustic Impacts on Marine Mammals 2006).

In these five events, exposure to acoustic energy has been considered a potential indirect cause of the death of marine mammals (Cox et al. 2006). A popular hypothesis regarding a potential cause of the strandings is that tissue damage results from a "gas and fat embolic syndrome" (Fernandez et al. 2005; Jepson et al. 2003, 2005). Models of nitrogen saturation in diving marine mammals have been used to suggest that altered dive behavior might result in the accumulation of nitrogen gas such that the potential for nitrogen bubble formation is increased (Houser et al. 2001, Zimmer and Tyack 2007). If so, this mechanism might explain the findings of gas and bubble emboli in stranded beaked whales. It is also possible that stranding is a behavioral response to a sound under certain contextual conditions and that the subsequently observed physiological effects of the strandings (e.g., overheating, decomposition, or internal hemorrhaging from being on shore) were the result of the stranding and not the direct result of exposure to sonar (Cox et al. 2006).

Non-TTS Risk Function Adapted from Feller (1968)

To assess the potential effects on marine mammals associated with active sonar used during training activity, the Navy and NMFS as cooperating agencies in previous analysis (NOAA 2008b, 2008c) applied a risk function that estimates the probability of behavioral responses that NMFS would classify as harassment for the purposes of the MMPA given exposure to specific received levels of MFA sonar. The mathematical function is derived from a solution in Feller (1968) as defined in the SURTASS LFA Sonar Final OEIS/EIS (DoN 2001), and relied on in the Supplemental SURTASS LFA Sonar EIS (DoN 2007a) for the probability of MFA sonar risk for MMPA Level B non-TTS behavioral harassment with input parameters modified by NMFS for MFA sonar for mysticetes, odontocetes (except harbor porpoises), and pinnipeds (NMFS 2008a, NOAA 2009). The same risk function and input parameters will be applied to high frequency active (HFA) (>10 kHz) sources until applicable data becomes available for high frequency sources.

In order to represent a probability of risk, the function should have a value near zero at very low exposures, and a value near one for very high exposures. One class of functions that satisfies this criterion is cumulative probability distributions, a type of cumulative distribution function. In selecting a particular functional expression for risk, several criteria were identified:

- The function must use parameters to focus discussion on areas of uncertainty;
- The function should contain a limited number of parameters;
- The function should be capable of accurately fitting experimental data; and
- The function should be reasonably convenient for algebraic manipulations.

As described in DoN (2001), the mathematical function below is adapted from a solution in Feller (1968).

$$R = \frac{1 - \left(\frac{L - B}{K}\right)^{-A}}{1 - \left(\frac{L - B}{K}\right)^{-2A}}$$

Where: R = risk (0 – 1.0);

L = Received Level (RL) in dB;

B = basement RL in dB; (120 dB);

K = the RL increment above basement in dB at which there is 50 percent risk;

A = risk transition sharpness parameter (10 for odontocetes, 8 for mysticetes).

In order to use this function, the values of the three parameters (B, K, and A) need to be established. The values used in this EIS/OEIS analysis are based on three sources of data: TTS experiments conducted at SSC and documented in Finneran, et al. (2001, 2003, and 2005; Finneran and Schlundt 2004); reconstruction of sound fields produced by the USS SHOUP associated with the behavioral responses of killer whales observed in Haro Strait and documented in Department of Commerce, NMFS (2005), DoN (2004), and Fromm (2004a, 2004b); and observations of the behavioral response of North Atlantic right whales exposed to alert stimuli containing mid-frequency components documented in Nowacek et al.

(2004). The input parameters, as defined by NMFS, are based on very limited data that represent the best available science at this time.

Data Sources Used For Risk Function

There is widespread consensus that cetacean response to MFA sound signals needs to be better defined using controlled experiments. Navy is contributing to an ongoing behavioral response study in the Bahamas that has provided some initial information on beaked whales, the species identified as potentially the most sensitive to MFA sonar. NMFS is leading this international effort with scientists from various academic institutions and research organizations to conduct studies on how marine mammals respond to underwater sound exposures. Field experiments in 2007 and 2008 with tagged beaked whales found reactions to all introduced sound stimulus consisted of the animals stopping their clicking, producing fewer foraging buzzes than normal, and ending their dive in a long and an unusually slow ascent moving away from the sound source (Tyack 2009). This suggested that beaked whales may be "particularly sensitive to anthropogenic sounds, but there is no evidence that they have a special sensitivity to sonar compared with other signals" (Tyack 2009). These initial findings are not in conflict with the current risk function. Until additional data beyond the three recently completed experimental exposures are available, NMFS and the Navy will continue use of the risk function established for recent Final Rules under MMPA for Navy training activities (e.g., NOAA 2009). NMFS and the Navy have determined that the following three data sets remain the most applicable for the direct use in developing risk function parameters for MFA/HFA sonar. These data sets represent the only known data that specifically relate altered behavioral responses to exposure to MFA sound sources.

Data from SSC's Controlled Experiments

Most of the observations of the behavioral responses of toothed whales resulted from a series of controlled experiments on bottlenose dolphins and beluga whales conducted by researchers at SSC's facility in San Diego, California (Finneran et al. 2001, 2003, 2005; Finneran and Schlundt 2004; Schlundt et al. 2000). In experimental trials with marine mammals trained to perform tasks when prompted, scientists evaluated whether the marine mammals performed these tasks when exposed to mid-frequency tones. Altered behavior during experimental trials usually involved refusal of animals to return to the site of the sound stimulus. This refusal included what appeared to be deliberate attempts to avoid a sound exposure or to avoid the location of the exposure site during subsequent tests. (Schlundt et al. 2000, Finneran et al. 2002) Bottlenose dolphins exposed to 1-sec intense tones exhibited short-term changes in behavior above received sound levels of 178 to 193 dB re 1 micropascal (ìPa) root mean square (rms), and beluga whales did so at received levels of 180 to 196 dB and above. Test animals sometimes vocalized after an exposure to impulsive sound from a seismic watergun (Finneran et al. 2002). In some instances, animals exhibited aggressive behavior toward the test apparatus (Ridgway et al. 1997, Schlundt et al. 2000).

Finneran and Schlundt (2004) examined behavioral observations recorded by the trainers or test coordinators during the Schlundt et al. (2000) and Finneran et al. (2001, 2003, 2005) experiments featuring 1-second (sec) tones. These included observations from 193 exposure sessions (fatiguing stimulus level > 141 dB re 1µPa) conducted by Schlundt et al. (2000) and 21 exposure sessions conducted by Finneran et al. (2001, 2003, 2005). The observations were made during exposures to sound sources at 0.4 kHz, 3 kHz, 10 kHz, 20 kHz, and 75 kHz. The TTS experiments that supported Finneran and Schlundt (2004) are further explained below:

Schlundt et al. (2000) provided a detailed summary of the behavioral responses of trained marine mammals during TTS tests conducted at SSC San Diego with 1-sec tones. Schlundt et al. (2000) reported eight individual TTS experiments. Fatiguing stimuli durations were 1-sec; exposure frequencies were 0.4 kHz, 3 kHz, 10 kHz, 20 kHz and 75 kHz. The experiments were conducted in San Diego Bay. Because of

the variable ambient noise in the bay, low-level broadband masking noise was used to keep hearing thresholds consistent despite fluctuations in the ambient noise. Schlundt et al. (2000) reported that "behavioral alterations," or deviations from the behaviors the animals being tested had been trained to exhibit, occurred as the animals were exposed to increasing fatiguing stimulus levels.

Finneran et al. (2001, 2003, 2005) conducted TTS experiments using tones at 3 kHz. The test method was similar to that of Schlundt et al. (2000) except the tests were conducted in a pool with very low ambient noise level (below 50 dB re 1 µPa/Hz), and no masking noise was used. Two separate experiments were conducted using 1-sec tones. In the first, fatiguing sound levels were increased from 160 to 201 dB SPL. In the second experiment, fatiguing sound levels between 180 and 200 dB re 1 µPa were randomly presented.

Data from Studies of Baleen (Mysticetes) Whale Responses

The only mysticete data available resulted from a field experiments in which baleen whales (mysticetes) were exposed to a range frequency sound sources from 120 Hz to 4500 Hz (Nowacek et al. 2004). An alert stimulus, with a mid-frequency component, was the only portion of the study used to support the risk function input parameters.

Nowacek et al. (2004) documented observations of the behavioral response of North Atlantic right whales exposed to alert stimuli containing mid-frequency components. To assess risk factors involved in ship strikes, a multi-sensor acoustic tag was used to measure the responses of whales to passing ships and experimentally tested their responses to controlled sound exposures, which included recordings of ship noise, the social sounds of conspecifics and a signal designed to alert the whales. The alert signal was 18-min of exposure consisting of three 2-minute signals played sequentially three times over. The three signals had a 60 percent duty cycle and consisted of: (1) alternating 1-sec pure tones at 500 Hz and 850 Hz; (2) a 2-sec logarithmic down-sweep from 4,500 Hz to 500 Hz; and (3) a pair of low (1,500 Hz)-high (2,000 Hz) sine wave tones amplitude modulated at 120 Hz and each 1-sec long. The purposes of the alert signal were (a) to provoke an action from the whales via the auditory system with disharmonic signals that cover the whales estimated hearing range; (b) to maximize the signal to noise ratio (obtain the largest difference between background noise) and c) to provide localization cues for the whale. Five out of six whales reacted to the signal designed to elicit such behavior. Maximum received levels ranged from 133 to 148 dB re 1µPa.

Observations of Killer Whales in Haro Strait in the Wild

In May 2003, killer whales (*Orcinus orca*) were observed exhibiting behavioral responses while the USS SHOUP was engaged in MFA sonar activities in the Haro Strait in the vicinity of Puget Sound, Washington. Although these observations were made in an uncontrolled environment, the sound field that may have been associated with the sonar activities had to be estimated, and the behavioral observations were reported for groups of whales, not individual whales, the observations associated with the USS SHOUP provide the only data set available of the behavioral responses of wild, noncaptive animal upon exposure to the SQS-53 MFA sonar. U.S. Department of Commerce (NMFS 2005), DoN (2004), Fromm (2004a, 2004b) documented reconstruction of sound fields produced by the USS SHOUP associated with the behavioral response of killer whales observed in Haro Strait. Observations from this reconstruction included an approximate closest approach time which was correlated to a reconstructed estimate of received level at an approximate whale location (which ranged from 150 to 180 dB), with a mean value of 169.3 dB.

Limitations of the Risk Function Data Sources

There are significant limitations and challenges to any risk function derived to estimate the probability of marine mammal behavioral responses; these are largely attributable to sparse data. Ultimately there

should be multiple functions for different marine mammal taxonomic groups, but the current data are insufficient to support them. The goal is unquestionably that risk functions be based on empirical measurement.

The risk function presented here is based on three data sets that NMFS and Navy have determined are the best available science at this time. The Navy and NMFS acknowledge each of these data sets has limitations. However, this risk function, if informed by the limited available data relevant to the MFA sonar application, has the advantages of simplicity and the fact that there is precedent for its application and foundation in marine mammal research.

While NMFS considers all data sets as being weighted equally in the development of the risk function, the Navy believes the SSC San Diego data is the most rigorous and applicable for the following reasons:

- The data represents the only source of information where the researchers had complete control over and ability to quantify the noise exposure conditions.
- The altered behaviors were identifiable due to long term observations of the animals.
- The fatiguing noise consisted of tonal exposures with limited frequencies contained in the MFA sonar bandwidth.

However, the Navy and NMFS do agree that the following are limitations associated with the three data sets used as the basis of the risk function:

- The three data sets represent the responses of only four species: trained bottlenose dolphins and beluga whales, North Atlantic right whales in the wild and killer whales in the wild.
- None of the three data sets represent experiments designed for behavioral observations of animals exposed to MFA sonar.
- The behavioral responses of marine mammals that were observed in the wild (observations of killer whales in Haro Strait) are based on an estimated received level of sound exposure; they do not take into consideration (due to minimal or no supporting data):
    - Potential relationships between acoustic exposures and specific behavioral activities (e.g., feeding, reproduction, changes in diving behavior, etc.), variables such as bathymetry, or acoustic waveguides; or
    - Differences in individuals, populations, or species, or the prior experiences, reproductive state, hearing sensitivity, or age of the marine mammal.

SSC San Diego Trained Bottlenose Dolphins and Beluga Data Set:

- The animals were trained animals in captivity; therefore, they may be more or less sensitive than cetaceans found in the wild (Domjan 1998).
- The tests were designed to measure TTS, not behavior.
- Because the tests were designed to measure TTS, the animals were exposed to much higher levels of sound than the baseline risk function (only two of the total 193 observations were at levels below 160 dB re 1 μPa^2-s).
- The animals were not exposed in the open ocean but in a shallow bay or pool.

North Atlantic Right Whales in the Wild Data Set

- The observations of behavioral response were from exposure to alert stimuli that contained mid-frequency components but was not similar to a MFA sonar ping. The alert signal was 18 min of exposure consisting of three 2-min signals played sequentially three times over. The three signals had a 60 percent duty cycle and consisted of (1) alternating 1-sec pure tones at 500 Hz and 850 Hz; (2) a 2-sec logarithmic down-sweep from 4,500 Hz to 500 Hz; and (3) a pair of low (1,500 Hz)- high (2,000 Hz) sine wave tones amplitude modulated at 120 Hz and each 1-sec long. This 18-min alert stimuli is in contrast to the average 1-sec ping every 30 sec in a comparatively very narrow frequency band used by military sonar.
- The purpose of the alert signal was, in part, to provoke an action from the whales through an auditory stimulus.

Killer Whales in the Wild Data Set

- The observations of behavioral harassment were complicated by the fact that there were other sources of harassment in the vicinity (other vessels and their interaction with the animals during the observation).
- The observations were anecdotal and inconsistent. There were no controls during the observation period, with no way to assess the relative magnitude of the any observed response as opposed to baseline conditions.

Input Parameters Risk Function

The values of B, K, and A need to be specified in order to utilize the risk function defined in Section 3.8.6.3. The risk continuum function approximates the dose-response function in a manner analogous to pharmacological risk assessment. In this case, the risk function is combined with the distribution of sound exposure levels to estimate aggregate impact on an exposed population.

Basement Value for Risk – The B Parameter

The B parameter defines the basement value for risk, below which the risk is so low that calculations are impractical. This 120 dB level is taken as the estimate received level (RL) below which the risk of significant change in a biologically important behavior approaches zero for the MFA/HFA sonar risk assessment. This level is based on a broad overview of the levels at which multiple species have been reported responding to a variety of sound sources, both mid-frequency and other, was recommended by the NMFS, and has been used in other publications (DoN 2008a,b; NOAA 2009). The Navy recognizes that for actual risk of changes in behavior to be zero, the signal-to-noise ratio of the animal must also be zero. However, the present convention of ending the risk calculation at 120 dB for MFA/HFA sonar has a negligible impact on the subsequent calculations, because the risk function does not attain appreciable values at received levels that low.

The K Parameter

NMFS and the Navy used the mean of the following values to define the midpoint of the function: (1) the mean of the lowest received levels (185.3 dB) at which individuals responded with altered behavior to 3 kHz tones in the SSC data set; (2) the estimated mean received level value of 169.3 dB produced by the reconstruction of the USS SHOUP incident in which killer whales exposed to MFA sonar (range modeled possible received levels: 150 to 180 dB); and (3) the mean of the five maximum received levels at which Nowacek et al. (2004) observed significantly altered responses of right whales to the alert stimuli than to the control (no input signal) is 139.2 dB SPL. The arithmetic mean of these three mean values is 165 dB SPL. The value of K is the difference between the value of B (120 dB SPL) and the 50 percent value of 165 dB SPL; therefore, K=45.

Risk Transition – The A Parameter

The A parameter controls how rapidly risk transitions from low to high values with increasing receive level. As A increases, the slope of the risk function increases. For very large values of A, the risk function can approximate a threshold response or step function. In consultation for the Hawaii Range Complex (HRC) EIS/OEIS, NMFS recommended that the Navy use A=10 as the value for odontocetes (except harbor porpoises), and pinnipeds, and A=8 for mysticetes (Figures 3.8-9 and 3.8-10) (NMFS 2008a, NOAA 2009)

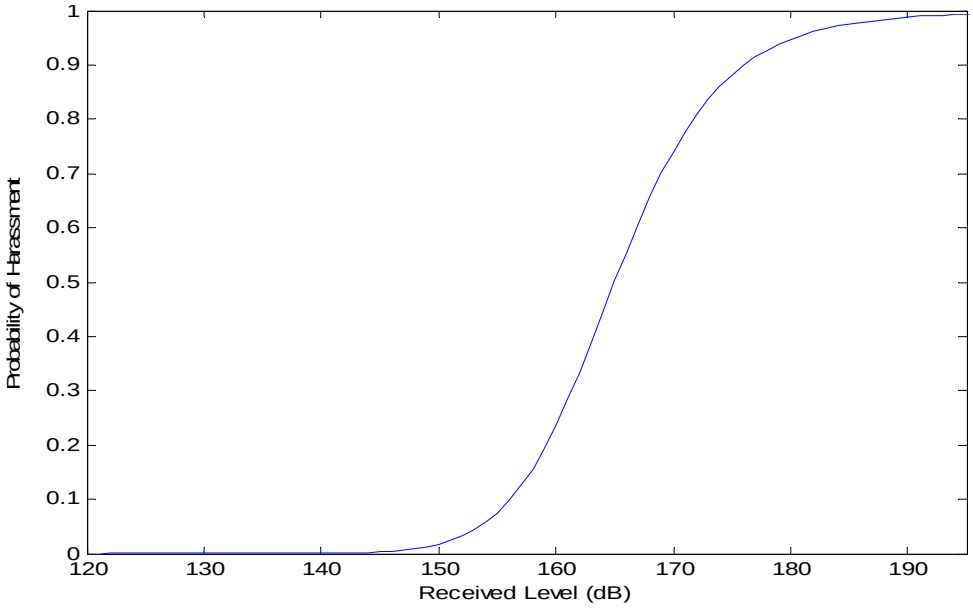


Figure 3.8-9: Risk Function Curve for Odontocetes (toothed whales) and Pinnipeds

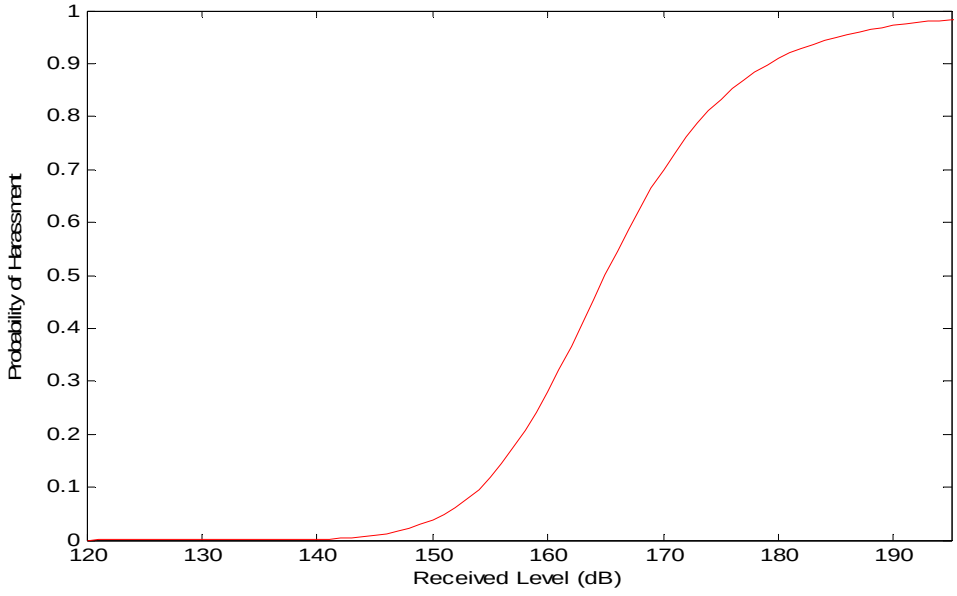


Figure 3.8-10: Risk Function Curve for Mysticetes (baleen whales)

Justification for the Steepness Parameter of A=10 for the Odontocete Curve

The NMFS independent review process described in Section 4.1.2.4.9 of DoN (2008b) provided the impetus for the selection of the parameters for the risk function curves. One scientist recommended staying close to the risk continuum concept as used in the SURTASS LFA sonar EIS. This scientist opined that both the basement and slope values; B=120 dB and A=10 respectively, from the SURTASS LFA sonar risk continuum concept are logical solutions in the absence of compelling data to select alternate values supporting the Feller-adapted risk function for MFA sonar. Another scientist indicated a steepness parameter needed to be selected, but did not recommend a value. Four scientists did not specifically address selection of a slope value. After reviewing the six scientists' recommendations, the two NMFS scientists recommended selection of A=10. Direction was provided by NMFS to use the A=10 curve for odontocetes based on the scientific review of potential risk functions developed for the HRC EIS/OEIS (DoN 2008a,b; NOAA 2009).

As background, a sensitivity analysis of the A=10 parameter was undertaken and presented in Appendix D of the SURTASS/LFA FEIS (DoN 2001). The analysis was performed to support the A=10 parameter for mysticete whales responding to a low-frequency sound source, a frequency range to which the mysticete whales are believed to be most sensitive to. The sensitivity analysis results confirmed the increased risk estimate for animals exposed to sound levels below 165 dB. Results from the Low Frequency Sound Scientific Research Program (LFS SRP) phase II research showed that whales (specifically gray whales in their case) did scale their responses with received level as supported by the A=10 parameter (Buck and Tyack, 2000). In the second phase of the LFS SRP research, migrating gray whales showed responses similar to those observed in earlier research (Malme et al. 1983, 1984) when the low frequency source was moored in the migration corridor (1.1 nm [2 km] from shore). The study extended those results with confirmation that a louder SL elicited a larger scale avoidance response. However, when the source was placed offshore (2.2 nm [4 km] from shore) of the migration corridor, the avoidance response was not evident. This implies that the inshore avoidance model – in which 50 percent of the whales avoid exposure to levels of 141 + 3 dB – may not be valid for whales in proximity to an offshore source (DoN 2001). As concluded in the SURTASS LFA Sonar Final OEIS/EIS (DoN 2001), the value of A=10 produces a curve that has a more gradual transition than the curves developed by the analyses of migratory gray whale studies (Malme et al. 1984; Buck and Tyack 2000; and SURTASS LFA Sonar EIS, Subchapters 1.43, 4.2.4.3 and Appendix D; NMFS 2008a; NOAA 2009).

Justification for the steepness parameter of A=8 for the Mysticete Curve

The Nowacek et al. (2004) study provides the only available data source for a mysticete species behaviorally responding to a sound source (i.e., alert stimuli) with frequencies in the range of tactical mid-frequency sonar (1-10 kHz), including empirical measurements of received levels (RLs). While there are fundamental differences in the stimulus used by Nowacek et al. (2004) and tactical mid-frequency sonar (e.g., source level, waveform, duration, directionality, likely range from source to receiver), they are generally similar in frequency band and the presence of modulation patterns. Thus, while they must be considered with caution in interpreting behavioral responses of mysticetes to mid-frequency sonar, they seemingly cannot be excluded from this consideration given the overwhelming lack of other information. The Nowacek et al. (2004) data indicate that five out the six North Atlantic right whales exposed to an alert stimuli "significantly altered their regular behavior and did so in identical fashion" (i.e., ceasing feeding and swimming to just under the surface). For these five whales, maximum RLs associated with this response ranged from root- mean-square sound (rms) pressure levels of 133-148 dB (re: 1 μPa).

When six scientists (one of them being Nowacek) were asked to independently evaluate available data for constructing a dose response curve based on a solution adapted from Feller (1968), the majority of them (4 out of 6; one being Nowacek) indicated that the Nowacek et al. (2004) data were not only appropriate but also necessary to consider in the analysis. While other parameters associated with the solution adapted

from Feller (1968) were provided by many of the scientists (i.e., basement parameter [B], increment above basement where there is 50 percent risk [K]), only one scientist provided a suggestion for the risk transition parameter, A.

A single curve may provide the simplest quantitative solution to estimating behavioral harassment. However, the policy decision, by NMFS-OPR, to adjust the risk transition parameter from A=10 to A=8 for mysticetes and create a separate curve was based on the fact the use of this shallower slope better reflected the increased risk of behavioral response at relatively low RLs suggested by the Nowacek et al. (2004) data. In other words, by reducing the risk transition parameter from 10 to 8, the slope of the curve for mysticetes is reduced. This results in an increase the proportion of the population being classified as behaviorally harassed at lower RLs. It also slightly reduces the estimate of behavioral response probability at quite high RLs, though this is expected to have quite little practical result owing to the very limited probability of exposures well above the mid-point of the function. This adjustment allows for a slightly more conservative approach in estimating behavioral harassment at relatively low RLs for mysticetes compared to the odontocete curve and is supported by the only dataset currently available. It should be noted that the current approach (with A=8) still yields an extremely low probability for behavioral responses at RLs between 133-148 dB, where the Nowacek data indicated significant responses in a majority of whales studied. (Note: Creating an entire curve based strictly on the Nowacek et al. [2004] data alone for mysticetes was advocated by several of the reviewers and considered inappropriate, by NMFS-OPR, since the sound source used in this study was not identical to tactical mid-frequency sonar, and there were only five data points available). The policy adjustment made by NMFS-OPR was also intended to capture some of the additional recommendations and considerations provided by the scientific panel (i.e., the curve should be more data driven and that a greater probability of risk at lower RLs be associated with direct application of the Nowacek et al. 2004 data).

Harbor Porpoises

The information currently available regarding these inshore species that inhabit shallow and coastal waters suggests a very low threshold level of response for both captive and wild animals. Threshold levels at which both captive (e.g. Kastelein et al. 2000, 2005, 2006) and wild harbor porpoises (e.g. Johnston, 2002) responded to sound (e.g. acoustic harassment devices (AHDs), acoustic deterrent devices (ADDs), or other nonpulsed sound sources) is very low (e.g. ~120 dB SPL), although the biological significance of the disturbance is uncertain. Therefore, Navy has not used the risk function curve but has applied a step function threshold of 120 dB SPL to estimate MMPA Level B non-TTS behavioral harassment exposure of harbor porpoises in the TMAA (i.e., assumes that all harbor porpoises exposed to 120 dB or higher MFAS will respond in a way NMFS considers behavioral harassment).

Application of the Risk Function and Current Regulatory Scheme

The risk function is used (in all cases other than the harbor porpoise) to estimate the percentage of an exposed population that is likely to exhibit behaviors that would qualify as MMPA Level B harassment (as that term is defined by the MMPA applicable to military readiness activities, such as the Navy's training and testing with mid- and high-frequency active sonar) at a given received level of sound (NOAA 2009). For example, at 165 dB SPL (dB re: 1µPa rms), the risk (or probability) of harassment is defined according to this function as 50 percent, and Navy/NMFS applies that by estimating that 50 percent of the individuals exposed at that received level are likely to respond by exhibiting behavior that NMFS would classify as behavioral harassment (NOAA 2009). The risk function is not applied to individual animals, only to exposed populations.

The data used to produce the risk function were compiled from four species that had been exposed to sound sources in a variety of different circumstances. As a result, the risk function represents a general relationship between acoustic exposures and behavioral responses that is then applied to specific

circumstances. That is, the risk function represents a relationship that is deemed to be generally true, based on the limited, best-available science, but may not be true in specific circumstances. In particular, the risk function, as currently derived, treats the received level as the only variable that is relevant to a marine mammal's behavioral response. However, we know that many other variables—the marine mammal's gender, age, and prior experience; the activity it is engaged in during an exposure event, its distance from a sound source, the number of sound sources, and whether the sound sources are approaching or moving away from the animal—can be critically important in determining whether and how a marine mammal will respond to a sound source (Southall et al. 2007). The data that are currently available do not allow for incorporation of these other variables in the current risk functions; however, the risk function represents the best use of the data that are available (NOAA 2009).

As more specific and applicable data become available, NMFS can use these data to modify the outputs generated by the risk function to make them more realistic (and ultimately, data may exist to justify the use of additional, alternate, or multi-variate functions). As mentioned above, it is known that the distance from the sound source and whether it is perceived as approaching or moving away can affect the way an animal responds to a sound (Wartzok et al. 2003, Southall et al. 2007). In the TMAA, modeling indicates animals exposed to received levels between 120 and 130 dB may be 36 to 57 nm (76 to 105 km) from a sound source; those distances would influence whether those animals might perceive the sound source as a potential threat, and their behavioral responses to that threat (DoN 2008a,b; NOAA 2009). Though there are data showing marine mammal responses to sound sources at that received level, NMFS does not currently have any data that describe the response of marine mammals to sounds at that distance (or to other contextual aspects of the exposure, such as the presence of higher frequency harmonics), much less data that compare responses to similar sound levels at varying distances (NOAA 2009). However, if data were to become available that suggested animals were less likely to respond (in a manner NMFS would classify as harassment) to certain levels beyond certain distances, or that they were more likely to respond at certain closer distances, Navy will re-evaluate the risk function to try to incorporate any additional variables into the "take" estimates. For distances to MMPA Level B harassments from non-TTS and the percent of MMPA Level B harassments for those distances in the TMAA for an SQS-53 sonar, see Table 3.8-5 and Figure 3.8-11.

Table 3.8-5: Non-TTS MMPA Level B Harassments at Each Received Level Band in the TMAA from SQS-53 Sonar

Received Level (dB SPL)	Distance at which Levels Occur in GOA	Percent of Behavioral Harassments Occurring at Given Levels
Below 138	42 km – 105 km	~ 0 %
138<Level<144	28 km – 42 km	< 1 %
144<Level<150	17 km – 28 km	~1 %
150<Level<156	9 km – 17 km	7 %
156<Level<162	5 km – 9 km	18 %
162<Level<168	2.5 km – 5 km	26 %
168<Level<174	1.2 km – 2.5 km	22 %
174<Level<180	0.5 km – 1.2 km	14 %
180<Level<186	335 m – 0.5 km	6 %
186<Level<TTS	178 m – 335 m	5 %

Notes: dB = decibel, GOA = Gulf of Alaska, km = kilometer, TMAA = Temporary Maritime Activities Area, MMPA = Marine Mammal Protection Act, nm = nautical mile, SPL = Sound Pressure Level

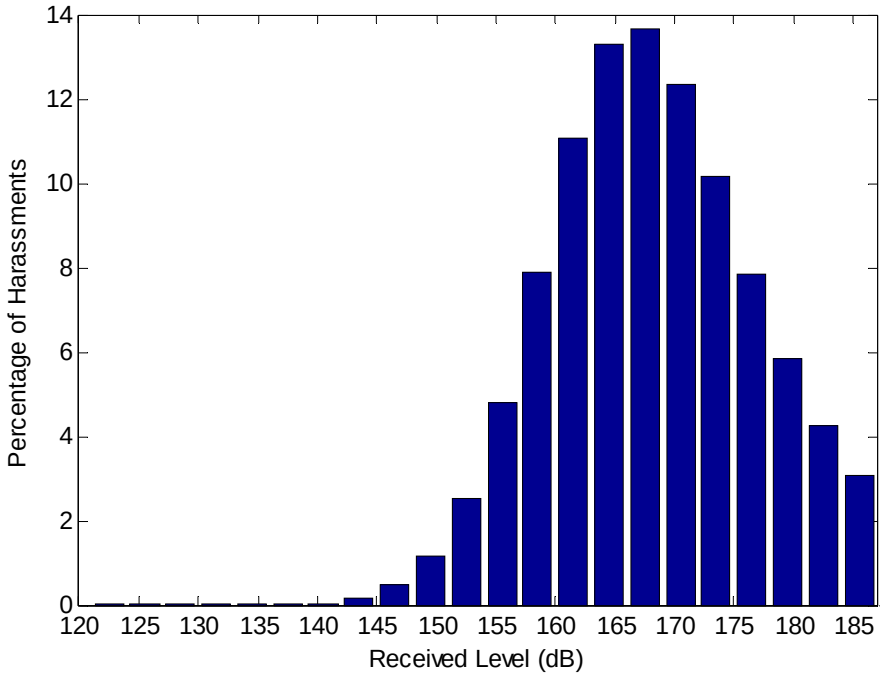


Figure 3.8-11: The Percentage of MMPA Level B Harassments from Non-TTS for Every 3 dB of Received Level in the TMAA

It is worth noting that Navy and NMFS would expect an animal exposed to the levels at the bottom of the risk function to exhibit non-TTS MMPA Level B harassment behavioral responses that are less likely to adversely affect the longevity, survival, or reproductive success of the animals that might be exposed, based on received level, and the fact that the exposures will occur in the absence of some of the other contextual variables that would likely be associated with increased severity of effects, such as the proximity of the sound source(s) or the proximity of other vessels, aircraft, submarines, etc. maneuvering in the vicinity of the exercise. NMFS will consider all available information (other variables, etc.), but all else being equal, takes that result from exposure to lower received levels and at greater distances from the exercises would be less likely to contribute to population level effects (NMFS 2008a, NOAA 2009).

3.8.7.5 Navy Protocols for Acoustic Modeling Analysis of Marine Mammal Exposures

The quantification of the acoustic modeling results for sonar includes additional analysis to increase the accuracy of the number of marine mammals affected. Table 3.8-6 provides a summary of the modeling protocols used in the standard Navy analysis. Modeling for ASW and other sound generating activities in the TMAA differ from these protocols in that the annual required sonar hours data was derived from projected future needs based on input gathered during previous Northern Edge Exercise planning conferences and discussions with U.S. Navy Third Fleet training directorate. Post modeling analysis includes reducing acoustic footprints where they encounter land masses, accounting for acoustic footprints for sources that overlap to accurately sum the total area when multiple ships are operating together, and to better account for the maximum number of individuals of a species that could potentially be exposed to sound sources within the course of one day or a discreet continuous event.

Table 3.8-6: Navy Protocols Providing for Modeling Quantification of Marine Mammal Exposures to Sonar

Historical Data	Sonar Positional Reporting System (SPORTS)	Annual active sonar usage data is obtained from the SPORTS database to determine the number of active sonar hours and the geographic location of those hours for modeling purposes.
Acoustic Parameters	SQS-53 and SQS-56	The SQS-53 and the SQS-56 active sonar sources are modeled separately to account for the differences in source level, frequency, and exposure effects.
	Submarine Sonar	Submarine active sonar use during ASW or ASUW is included in effects analysis calculations using the SPORTS database.
Post Modeling Analysis	Land Shadow	For sound sources within the acoustic footprint of land, the land area is subtracted from the marine mammal exposure calculation.
	Multiple Ships	Correction factors are used to address the maximum potential of exposures to marine mammals resulting from multiple counting based on the acoustic footprint when there are occasions for more than one ship operating within approximately 76 nm (140 km) of one another.
	Multiple Exposures	Accurate accounting for TMAA training events within the course of one day or a discreet continuous sonar event:

Notes: ASW = Anti-submarine Warfare, ASUW = Anti-Surface Warfare, GOA = Gulf of Alaska, km = kilometer, TMAA = Temporary Maritime Activities Areas, nm = nautical mile

3.8.7.6 Analytical Framework for Assessing Marine Mammal Response to At-Sea Explosions

The effects of an at-sea explosion on a marine mammal depends on many factors, including the size, type, and depth of both the animal and the explosive charge; the depth of the water column; the standoff distance between the charge and the animal; and the sound propagation properties of the environment. Potential impacts can range from brief acoustic effects (such as behavioral disturbance), tactile perception, physical discomfort, slight injury of the internal organs and the auditory system, to death of the animal (Yelverton et al. 1973, O'Keeffe and Young 1984, DoN 2001). Non-lethal injury includes slight injury to internal organs and the auditory system; however, delayed lethality can be a result of individual or cumulative sublethal injuries (DoN 2001a). Short-term or immediate lethal injury would result from massive combined trauma to internal organs as a direct result of proximity to the point of detonation (DoN 2001a).

Criteria

The criterion for mortality for marine mammals is "onset of severe lung injury" as presented in the Final Rule for the Hawaii Range Complex MMPA Letter of Authorization (NOAA 2009). This is conservative in that it corresponds to a 1 percent chance of mortal injury, and yet any animal experiencing onset severe lung injury is counted as a lethal exposure.

- The threshold is stated in terms of the Goertner (1982) modified positive impulse with value "indexed to 31 psi-ms.'" Since the Goertner approach depends on propagation, source/animal depths, and animal mass in a complex way, the actual impulse value corresponding to the 31-psi-ms index is a complicated calculation. Again, to be conservative, CHURCHILL used the mass of a calf dolphin (at 26.4 pound [lb] [12.2 kilogram {kg}]), so that the threshold index is 30.5 pounds per square inch (psi)-ms (Table 3.8-7).

- Two criteria are used for injury: onset of slight lung hemorrhage and 50 percent eardrum rupture (tympanic membrane [TM] rupture). These criteria are considered indicative of the onset of injury (Table 3.8-7).
- The threshold for onset of slight lung injury is calculated for a small animal (a dolphin calf weighing 27 lb [12 kg]), and is given in terms of the "Goertner modified positive impulse," indexed to 13 psi-ms in the (DoN 2001a, 2008a,b). This threshold is conservative since the positive impulse needed to cause injury is proportional to animal mass, and therefore, larger animals require a higher impulse to cause the onset of injury.
- The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM rupture); this is stated in terms of an SEL value of 205 dB re 1 μPa^2-s. The criterion reflects the fact that TM rupture is not necessarily a serious or life-threatening injury, but is a useful index of possible injury that is well correlated with measures of permanent hearing impairment (e.g., Ketten 1998 indicates a 30 percent incidence of PTS at the same threshold).

Table 3.8-7: Effects Analysis Criteria for At-Sea Explosions

	Criterion	Metric	Threshold	Comments
Mortality	Mortality Onset of extensive lung hemorrhage	Shock Wave Goertner modified positive impulse	30.5 psi-msec*	All marine mammals (dolphin calf)
Level A Harassment	Slight Injury Onset of slight lung hemorrhage	Shock Wave Goertner modified positive impulse	13.0 psi-msec*	All marine mammals (dolphin calf)
	Slight Injury 50 percent Tympanic Membrane (TM) Rupture	Shock Wave Sound Exposure Level (SEL) for *any single exposure*	205 dB re:1μPa^2-sec	All marine mammals
Level B Harassment	TTS Temporary Auditory Effects	Noise Exposure greatest SEL in any 1/3-octave band *over all exposures*	182 dB re:1μPa^2-sec	For odontocetes greatest SEL for frequencies ≥100 Hz and for mysticetes ≥10 Hz
	TTS Temporary Auditory Effects	Noise Exposure Peak Pressure	23 psi	All marine mammals
	Sub-TTS Behavioral Disturbance (MSE only)	Noise Exposure greatest SEL in any 1/3-octave band *over all exposures*	177 dB re:1μPa^2-sec	For odontocetes greatest SEL for frequencies ≥100 Hz and for mysticetes ≥10 Hz

Notes: Goertner 1982. Prediction of at-sea explosion safe ranges for sea mammals. Naval Surface Weapons Center, White Oak Laboratory, Silver Spring, MD. NSWC/WOL TR-82-188. 25 pp.
DoN, 2001a. USS Churchill Shock Trail FEIS- February, 2001.
NMFS. Briefed to NMFS for VAST-IMPASS.
dB re 1μPa^2-s = decibels referenced to 1 micropascal squared per second, Hz = hertz
MSE = Multiple Successive Explosions, msec = millisecond
psi = pounds per square inch, SEL = Sound Exposure Level
TM = Tympanic membrane, TTS = Temporary Threshold Shift

The following criterion is considered for noninjurious harassment TTS, which is a temporary, recoverable, loss of hearing sensitivity (NMFS 2001, DoN 2001a, NOAA 2009).

- A threshold of 12 psi peak pressure was developed for 10,000-lb charges as part of the CHURCHILL Final EIS (DoN 2001a, [FR70/160, 19 Aug 05; FR 71/226, 24 Nov 06]). It was introduced to provide a more conservative safety zone for TTS when the explosive or the animal approaches the sea surface (for which case the explosive energy is reduced but the peak pressure is not). Navy policy with concurrence from NMFS is to use a 23 psi criterion for explosive charges less than 2,000 lb (907 kg) and the 12 psi criterion for explosive charges larger than 2,000 lb (907 kg). This is below the level of onset of TTS for an odontocete (Finneran et al. 2002). All explosives modeled for the TMAA are less than 1,500 lb (608 kg).
- A threshold of 182 dB re:1μPa^2-sec for any 1/3 octave band over all exposures

The approximate nominal radial distance from various at-sea explosives to these thresholds in the TMAA during the summer time-frame are presented in Table 3.8-7a.

Table 3.8-7a. Approximate Distance to Effects in Meters for At-Sea Explosives in the Temporary Maritime Activities Area

Explosive Source	MMPA Level B Harassment (behavioral disturbance)			MMPA Level A Harassment (slight injury)		Severe Injury or Mortality
	Sub-TTS, 177 dB re 1 μPa^2-s	TTS, 182 dB re 1 μPa^2-s	TTS, 23 psi peak pressure	50 percent TM rupture, 205 dB re 1 μPa^2-s	Lung injury, 13 psi-ms	30.5 psi-ms impulse pressure
MK-82	2720	1584	809	302	263	153
MK-83	4056	2374	1102	468	330	195
MK-84	5196	3050	1327	611	378	226
76 mm	168	95	150	19	25	13
5 inch	413	227	269	43	44	23
SSQ-110A sonobuoy (EER/IEER)	NA	325	271	71	135	76

Notes: dB re 1 μPa^2-s = decibels referenced to 1 micropascal squared per second, EER = Extended Echo Ranging, IEER = Improved Extended Echo Ranging, mm = millimeters, MMPA = Marine Mammal Protection Act, psi = pounds per square inch, psi-ms= pounds per square inch per millisecond, TM = Tympanic Membrane, TTS = Temporary Threshold Shift

MMPA Level B Harassment from Sub-TTS for Multiple Successive Explosions (MSE)

There may be rare occasions when multiple successive explosions are part of a static location event such as during SINKEX, BOMBEX, or GUNEX (when using other than inert weapons). For MSEs, accumulated energy over the entire training time is the natural extension for energy thresholds since energy accumulates with each subsequent shot; this is consistent with the treatment of multiple arrivals as first presented in Churchill (DoN 2001). For positive impulse, NMFS has determined it is consistent with Churchill to use the maximum value over all impulses received (NOAA 2009).

For MSE, the acoustic criterion for sub-TTS MMPA Level B harassment is used to account for behavioral effects significant enough to be judged as harassment, but occurring at lower sound energy levels than those that may cause TTS. The threshold for MMPA Level B harassment from sub-TTS is derived following the approach NMFS has established for the energy-based TTS threshold (NOAA 2009).

The research on pure tone exposures reported in Schlundt et al. (2000) and Finneran and Schlundt (2004) provided the pure-tone threshold of 192 dB as the lowest TTS value. This value is modified for explosives by (a) interpreting it as an energy metric, (b) reducing it by 10 dB to account for the time constant of the mammal ear, and (c) measuring the energy in 1/3 octave bands, the natural filter band of the ear. The resulting TTS threshold for explosives is 182 dB re 1 mPa^2-s in any 1/3 octave band. As reported by Schlundt et al. (2000) and Finneran and Schlundt (2004), instances of altered behavior in the

pure tone research generally began five dB lower than those causing TTS. The threshold is therefore derived by subtracting five dB from the 182 dB re 1 mPa^2-s in any 1/3 octave band threshold, resulting in a 177 dB re 1 μPa^2-s sub-TTS MMPA Level B harassment threshold for multiple successive explosives that may result in behavioral disturbance (NOAA 2009).

3.8.7.7 Environmental Consequences

This section discusses the potential environmental effects associated with the use of active sonar and other Navy training activities within the TMAA. In determining the potential environmental consequences, an approach was established to differentiate between significant and non-significant effects. This approach involved using either documented regulatory criteria or the best scientific information available at the time of analysis. Further, the extent of significance was evaluated using the context (e.g., short- versus long-term) of the Proposed Action and the intensity (severity) of the potential effect.

Acoustic Impact Model Process Applicable to All Alternative Discussions

The methodology for analyzing potential impacts from sonar and explosives is presented in Appendix D, which explains the modeling process in detail, describes how the impact threshold derived from Navy-NMFS consultations are derived, and discusses relative potential impact based on species biology.

The Navy acoustic exposure model process uses a number of inter-related software tools to assess potential exposure of marine mammals to Navy generated underwater sound including sonar and explosions. For sonar, these tools estimate potential impact volumes and areas over a range of thresholds for sonar specific operating modes. Results are based upon extensive pre-computations over the range of acoustic environments that might be encountered in the operating area (Appendix D).

The acoustic model includes four steps used to calculate potential exposures:

1. Identify unique acoustic environments that encompass the operating area. Parameters include depth and seafloor geography, bottom characteristics and sediment type, wind and surface roughness, sound velocity profile, surface duct, sound channel, and convergence zones.

2. Compute transmission loss (TL) data appropriate for each sensor type in each of these acoustic environments. Propagation can be complex depending on a number of environmental parameters listed in step one, as well as sonar operating parameters such as directivity, source level, ping rate, and ping length, and for explosives the amount of explosive material detonated. The standard Navy Comprehensive Acoustic Simulation System/Gaussian Ray Bundle (CASS-GRAB) acoustic propagation model is used to resolve complexities for underwater propagation prediction.

3. Use that TL to estimate the total sound energy received at each point in the acoustic environment.

4. Apply this energy to predicted animal density for that area to estimate potential acoustic exposure, with animals distributed in 3-D based on best available science on animal dive profiles.

Model Results Explanation

A large body of research on terrestrial animal and human response to airborne sound exists, but results from those studies are not readily applicable to the development of behavioral criteria and thresholds for marine mammals. Differences in hearing thresholds, dynamic range of the ear, and the typical exposure patterns of interest (e.g., human data tend to focus on 8-hour-long exposures), and the difference between acoustics in air and in water make extrapolation of human sound exposure standards inappropriate.

For purposes of predicting potential acoustic and explosive effects on marine mammals, the Navy uses an acoustic impact model process with numeric criteria agreed upon with the NMFS (NOAA 2009). While this process is described more completely in Appendix D, there are some caveats necessary to understand in order to put these exposures in context and used in recent Final Rules (NOAA 2008b, 2008c).

For instance, (1) significant scientific uncertainties are implied and carried forward in any analysis using marine mammal density data as a predictor for animal occurrence within a given geographic area; (2) there are limitations to the actual model process based on information available (animal densities, animal depth distributions, animal motion data, impact thresholds, and supporting statistical model); and (3) determination and understanding of what constitutes a significant behavioral effect is still unresolved.

The sources of marine mammal densities used in this analysis are derived from NMFS broad scale surveys. However, although survey design includes statistical placement of survey tracks, the survey itself can only cover so much ocean area and post-survey statistics are used to calculate animal abundances and densities (Barlow and Forney, 2007). There is often significant statistical variation inherit within the calculation of the final density values depending on how many sightings were available during a survey.

Occurrence of marine mammals within any geographic area, such as the TMAA, is highly variable and strongly correlated to parameters such as oceanographic conditions, prey availability, and ecosystem level patterns rather than broad changes in a stock's reproduction success and survival (Forney 2000, Ferguson and Barlow 2001, Benson et al. 2002, Moore et al. 2002, Tynan 2005, Redfern 2006). For some species, distribution may be even more highly influence by relative small scale features over both short and long-term time scales (Ballance et al. 2006, Etnoyer et al. 2006, Ferguson et al. 2006, Skov et al. 2007). Unfortunately, the scientific level of understanding of some large scale and most small scale processes thought to influence marine mammal distribution is incomplete.

Given the uncertainties in marine mammal density estimation and localized distributions, the Navy's acoustic impact models can not currently be used to predict occurrence of marine mammals within specific regions of the GOA. To resolve this issue and allow modeling to proceed, animals are uniformly distributed within acoustic modeling provinces as described in Appendix D. This process does not account for animals that move into or out of the region based on foraging and migratory patterns, and adds a significant amount of variability to the model predictions. Parameters have, therefore, been chosen to err on the side of overestimation.

Results, therefore, from acoustic impact exposure models should be regarded as exceedingly conservative estimates strongly influenced by limited biological data. While numbers generated allow establishment of predicted marine mammal exposures for consultation with NMFS, the short duration and limited geographic extent of most sonar and at-sea explosive events does not necessarily mean that these exposures will in fact occur.

In addition to the predicted exposure numbers or expected values resulting from acoustic modeling, there remains the possibility, although rare, that a marine mammal may be present in the TMAA when Navy activities are occurring (rare in this context refers to a species that is few in number in the GOA).

For some species whose numbers are few but have a known abundance (e.g., sperm whale, gray whale, minke whale), acoustic modeling was completed but the results indicate no predicted exposures for at-sea explosions under any alternative. For other species (blue whale, California sea lion, harbor porpoise, harbor seal, North Pacific Right whale, and sei whale), there are no valid abundance or density estimates for the TMAA. However, even if an accurate abundance or density could be derived for these species, being so few in number in the TMAA, accepted modeling methodology will predict zero exposures (based on modeling results for species with higher abundance such as sperm and gray whale, but having

no predicted exposures). To account for the possibility that harassment of rare marine mammals may occur, special consideration has been given these cases. Therefore, for each proposed 21-day exercise period, the number of behavioral harassments per rare species will be based on an assumption of having exposed the species average group size[5] to one instance of behavioral harassment to account for all at-sea explosions and one instance average group size behavioral harassment to account for all acoustic sources (e.g., sonar, pingers, EMATT) for purposes of this analysis in the TMAA. This average group size estimate was only used if there was no density data available for modeling or if modeling resulted in zero exposures for the species. Table 3.8-8 provides the average group size for rare species in the TMAA as derived or reported from the citations listed.

Table 3.8-8: Average Group Size for Rare Species in the TMAA

Species	Average Group Size - Rounded[1]	Total Encounters (number of individuals)	Reference
ESA Listed Cetacea			
Blue whale	1	15(15)	Calambokidis et al., (2009)
Humpback whale	2	11(20)	Rone et al., (2009)
North Pacific right whale	1	1(1)[2]	Angliss and Allen (2008)
Sei whale	4	-	Leatherwood et al., (1988)
Sperm whale	1[3]	-	Rone et al., (2009)
Non-ESA Listed Cetacea			
Baird's beaked whale	11[4]	n/a	Wade et al., (2003)
Gray whale	3	3(8)	Rone et al., (2009)
Harbor porpoise	2	30(89)	Rone et al., (2009)
Minke whale	2	2(3)	Rone et al., (2009)
Non-ESA Listed Pinniped			
California sea lion	1[5]	-	-
Harbor seal	1	2(2)	Rone et al., (2009)

1. Lacking otherwise published numbers for Average Group Size for marine mammals in the TMAA, the method for deriving Average Group Size for use in quantifying the potential for rare animals was to take survey data providing the total number of animals sighted and dividing that by the number of visual encounters for each species during that survey with the resulting number then rounded to a whole number.
2. Based on the sighting in GOA of one lone North Pacific right whale in with a group of humpbacks from Waite (2003).
3. Based on no sightings of family groups although numerous acoustic detections were made.
4. Based on sightings in Alaska waters (DoN 2006).
5. It is assumed given that California sea lions are very rare in GOA, that they would only be encountered individually even if a prey species was running.

[5] With regard to marine mammals, the "average group size" (sometimes also "mean group size") is a commonly reported estimate derived from data collected during a marine mammal survey. Average group size is typically defined as the estimated total number of individual animals of a species divided by the number of sightings of groups of that species. Marine mammal observers generally record best, high, and low group size estimates for each sighting. For species with highly variable group sizes, different methods can be used to derive a measure of "average group size" based on the observers' combined estimates. In addition, when survey data are used to estimate species abundance, various methods are often used to reduce the potential for bias (i.e., larger groups are easier to detect and can be over-represented in a sample) and group size estimates can be derived in a much more complex manner (see Buckland et al. 1993). Resulting average group size numbers are often integers and reported with a corresponding percent coefficient of variation (% CV) to represent the precision of the estimate. For purposes of estimating effects in this analysis, an approximate rounded average group size number is used. This number is not meant to be an accurate representation of average group size for calculating abundance and density but is used to account for the potential presence of rare animals during Navy training in the TMAA.

Behavioral Responses

Behavioral responses to exposure from MFA and HFA sonar, other non-sonar acoustic sources, and at-sea explosions can range from no observable response to panic, flight and possibly stranding (Figure 3.8-12) (NOAA 2009). Recent behavioral response study field experiments with tagged beaked whales found their reactions to MFA sonar consisted of the animals stopping their clicking, producing fewer foraging buzzes than normal, and ending their dives in a long and an unusually slow ascent moving away from the sound source (Tyack 2009). It was further suggested based on these response studies that beaked whales may be "particularly sensitive to anthropogenic sounds, but there is no evidence that they have a special sensitivity to sonar compared with other signals" (Tyack 2009).

It has been long recognized that the intensity of the behavioral responses exhibited by marine mammals depends on a number of conditions including the age, reproductive condition, experience, behavior (foraging or reproductive), species, received sound level, type of sound (impulse or continuous) and duration of sound (Reviews by Richardson et al. 1995, Wartzok et al. 2003, Cox et al. 2006, Nowacek et al. 2007, Southall et al. 2007). Many behavioral responses may be short term (seconds to minutes) and of little immediate consequence for the animal such as simply orienting to the sound source. Alternatively, there may be a longer term response over several hours such as moving away from the sound source. In addition, some responses have the potential life function consequences such as leading to a stranding or a mother-offspring separation (Baraff and Weinrich 1993, Gabriele et al. 2001). Generally the louder the sound source the more intense the response although duration, context, and disposition of the animal are also very important (Southall et al. 2007). Exposure to loud sounds resulting from Navy training would be brief as the ship and other participants are constantly moving and the animal will likely be moving as well.

According to the severity scale response spectrum proposed by Southall et al. (2007) (Figure 3.8-12), responses classified as from 0-3 are brief and minor, those from 4-6 have a higher potential to affect foraging, reproduction, or survival and those from 7-9 are likely to affect foraging, reproduction and survival. Sonar and explosive mitigation measures (sonar power-down or shut-down zones and explosive exclusion zones) would likely prevent animals from being exposed to the loudest sonar sounds or explosive effects that could potentially result in TTS or PTS and more intense behavioral reactions (i.e. 7-9) on the response spectrum.

There are little data on the consequences of sound exposure on vital rates of marine mammals. Several studies have shown the effects of chronic noise (either continuous or multiple pulses) on marine mammal presence in an area exposed to seismic survey airguns or ship noise (e.g., Malme et al. 1984, McCauley et al. 1998, Nowacek et al. 2004). MFA sonar use in Navy ranges is not new and has occurred using the same basic sonar equipment and output for over approximately 30 years. Given this history the Navy believes that risk to marine mammals from sonar training is low.

Even for more cryptic species such as beaked whales, the main determinant of causing a stranding appears to be exposure in a limited egress area (a long narrow channel) with multiple ships. This would be consistent with the recent suggestion that beaked whales are not particularly sensitive to sonar but tend to move away from all anthropogenic noise (Tyack 2009). When animals are unable to avoid the exposure because of constricted areas and multiple ships, in these specific circumstances and conditions MFA sonar is believed to have contributed to the stranding and mortality of a small number of beaked whales in locations other than the GOA. There are no limited egress areas (long narrow channels) or landmasses within the TMAA, therefore, it is unlikely that the proposed sonar use would result in any strandings. Although the Navy has substantially changed operating procedures to avoid the aggregate of circumstances that may have contributed to previous strandings, it is important that future unusual stranding events be reviewed and investigated so that any human cause of the stranding can understood and avoided.



Figure 3.8-12: Marine Mammal Response Spectrum to Anthropogenic Sounds (Numbered severity scale for ranking observed behaviors from Southall et al. 2007)

There have been no known beaked whale strandings in the GOA associated with the use of MFA/HFA sonar by fisheries research activities or seismic research. There are critical contextual differences between the TMAA and areas of the world where beaked whale strandings have occurred (see Appendix F). While the absence of evidence does not prove there have been no impacts on beaked whales, decades of use of sonar in Navy concentration areas (e.g., Southern California, the Atlantic Coast, Gulf of Mexico) with no

observed beaked whale strandings associated with MFA sonar, or indications of significant effects to species or populations of beaked whales has been given consideration.

TTS

A TTS is a temporary recoverable, loss of hearing sensitivity over a small range of frequencies related to the sound source to which it was exposed. The animal may not even be aware of the TTS and does not become deaf, but requires a louder sound stimulus (relative to the amount of TTS) to detect that sound within the affected frequencies. TTS may last several minutes to several days and the duration is related to the intensity of the sound source and the duration of the sound (including multiple exposures). Sonar exposures from ASW training are generally short in duration and intermittent (several sonar pings per minute from a moving ship), and with mitigation measures in place, TTS in marine mammals exposed to MFA or HFA sonar or other sound sources and at-sea explosions are unlikely to occur. There is currently no information to suggest that if an animal has TTS, that it will decrease the survival rate or reproductive fitness of that animal. TTS range from an SQS-53 sonar's 235 dB source level one second ping is approximately 584 ft (178 m) from the bow of the ship under nominal oceanographic conditions during the summer in the TMAA.

PTS

A PTS is non-recoverable, results from the destruction of tissues within the auditory system and occurs over a small range of frequencies related to the sound exposure. The animal does not become deaf but requires a louder sound stimulus (relative to the amount of PTS) to detect that sound within the affected frequencies. Sonar exposures are general short in duration and intermittent (several sonar pings per minute from a moving ship), and with mitigation measures in place, PTS in marine mammals exposed to MFA or HFA sonar is very unlikely to occur. There is currently no information to suggest that if an animal has PTS that it decrease the survival rate or reproductive fitness of that animal. The distance to PTS from an SQS-53 sonar's 235 dB source level and one second ping is approximately 33 ft (10 m) from the bow of the ship under nominal oceanographic conditions in the TMAA.

Population Level Effects

Some Navy training activities will be conducted in the same general areas across the 42,146 nm^2 (145,482 km^2) of the TMAA over a 21-day (maximum) exercise period, so marine mammal populations could be exposed to activities more than once over the period of the exercise. The acoustic analyses assume that short-term non-injurious sound levels predicted to cause TTS and/or non-TTS behavioral disruptions qualify as MMPA Level B harassment. Based on previous findings from NMFS, however, it is unlikely that most behavioral disruptions or instances of TTS will result in long-term significant effects (NMFS 2008a, NOAA 2009). Mitigation measures reduce the likelihood of exposures to sound levels that would cause significant behavioral disruption (the higher levels of 7-9 in Figure 3.8-12), TTS or PTS. Based on acoustic modeling the Navy has estimated that a total of 420,342 marine mammals per year might be behaviorally disturbed resulting in MMPA Level B harassment from the proposed training activities in the TMAA. The Navy does not anticipate any mortality to result from the proposed training. It is unlikely that the short-term behavioral disruption would adversely affect the species or stock through effects on annual rates of recruitment or survival.

Acoustic Effects Analysis

The impacts on marine mammals from at-sea explosions are based on a modeling approach that considers several factors to ensure an accurate estimation of effects by species.

The impact areas of the at-sea explosions are derived from mathematical calculations and models that predict the distances to which threshold noise levels would travel. The equations for the models consider

the amount of net explosive, the properties of detonations under water, and environmental factors such as depth of the explosion, overall water depth, water temperature, and bottom type.

The result of the analysis is an area known as the Zone of Influence (ZOI). A ZOI is based on an outward radial distance from the point of detonation, extending to the limit of a particular threshold level in a 360-degree area. Thus, there are separate ZOIs for mortality, injury (hearing-related injury and slight, nonfatal lung injury), and harassment (temporary threshold shift, or TTS, and sub-TTS). The ZOIs are also influenced by the body size and species of marine mammal exposed. Given the radius, and assuming noise spreads outward in a spherical manner, the entire area ensonified (i.e., exposed to the specific noise level being analyzed) is estimated. The radius is assumed to extend from the point of detonation in all directions, allowing calculation of the affected area.

The number of marine mammal takes is estimated by applying marine mammal density to the ZOI (area) for each detonation type. Species density for the more abundant marine mammals is presented in Tables 3.8-1 and 3.8-2. This derived density data were input into the modeling with factors applied to account for the species specific dive behaviors, as detailed in Appendix D and E. By combining marine mammal density and dive behaviors, a more accurate prediction of acoustic exposure is possible. The model-specific adjustments applied for each type of detonation are described in the following paragraphs.

At-sea explosives detonated underwater introduce loud, impulsive, broadband sounds into the marine environment. Three source parameters influence the effect of an explosive: the weight of the explosive, the type of explosive material, and the detonation depth. The net explosive weight (or NEW) accounts for the first two parameters. The NEW of an explosive is the weight of only the explosive material in a given round, referenced to the explosive power of TNT.

The detonation depth of an explosive is particularly important due to a propagation effect known as surface-image interference increasingly. For sources located near the sea surface, a distinct interference pattern arises from the coherent sum of the two paths that differ only by a single reflection from the pressure-release surface. As the source depth and/or the source frequency decreases, these two paths increasingly, destructively interfere with each other, reaching total cancellation at the surface (barring surface-reflection scattering loss).

For the TMAA, explosive sources having detonations in the water include the following: SSQ-110 EER sonobuoys, MK-82, MK-83, MK-84 bombs, 5” and 76 mm gunnery rounds, MK-48 torpedo, and the Maverick missile. The EER source can be detonated at several depths within the water column. For the modeling analysis, a relatively shallow depth of 65 ft (20 m) was used to optimize the likelihood of the source being positioned in a surface duct. A source depth of two meters was used for bombs and missiles that do not strike their target. The MK-48 torpedo detonates immediately below the target’s hull and a nominal depth of 50 ft (14 m) was used as its source depth in this analysis. For the gunnery rounds, a source depth of one foot was used. The NEW modeled for these sources are as follows:

- SSQ-110 sonobuoy - 4.4 lb (2 kg)
- MK-82 bomb - 238 lb (108 kg),
- MK-83 bomb - 416 lb (189 kg)
- MK-84 bomb – 945 lb (429 kg)
- 5” rounds – 9.5 lb (4.3 kg),
- 76 mm rounds – 1.6 lb (0.7 kg)
- MK-48 torpedo – 851 pounds (386 kg)
- Maverick missile – 78.5 lb (36 kg)

The exposures expected to result from these sources are computed on a per in-water explosive basis. The cumulative effect of a series of explosives can often be derived by simple addition if the detonations are spaced widely in time (exceeding 24 hours per the NMFS threshold for multiple successive explosions) or space, allowing for sufficient animal movements to ensure a different population of animals is considered for each detonation (NOAA 2009).

GUNEX

Modeling was completed for surface gunnery exercises that take place in the open ocean to provide gunnery practice for Navy ship crews. Exercises can involve a variety of surface targets that are either stationary or maneuverable. Gun systems employed against surface targets include the 5-inch, 76mm, 57mm, 25mm, 20mm, .50-caliber, and the 7.62mm (only a small percentage of the 5-inch and 76mm rounds are inert). The ZOI, for explosives when multiplied by the estimated animal densities and total number of events, provides exposure estimates for that animal species for the given gunnery system using live ordnance.

BOMBEX

Modeling was completed for three explosive weights involved in BOMBEX, each assumed detonation at 3.3-ft (1-m) depth. The NEW used in simulations of the MK82, MK83, and MK84 explosives are 192.2 lb (87.2 kg), 415.8 lb (188.6 kg), 944.7 lb (428.5 kg), respectively. The ZOI, when multiplied by the estimated animal densities and total number of events, provides exposure estimates for that animal species for the given bomb source.

SSQ-110 Sonobuoys

Modeling was completed for use of SSQ-110 sonobuoys, which have a charge totaling 4.4 lb (2 kg) for each of two detonations. The ZOI for the detonation is then multiplied by the estimated animal densities and total number of events, provides exposure estimates for that animal species for the use of SSQ-110 sonobuoys for each alternative.

Impact Thresholds

In addition to the impact thresholds described previously, this EIS/OEIS analyzes potential effects to marine mammals in the context of the MMPA, ESA (listed species only), and EO 12114 where applicable. The factors used to assess the significance of effects vary under these Acts and are discussed below.

For purposes of compliance with the MMPA, effects of the action were analyzed to determine if an alternative would result in Level A harassment or Level B harassment of marine mammals based on previous standards established by NMFS (NOAA 2009). For military readiness activities under the MMPA, the relevant definition of harassment is any act that:

- Injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment).
- Disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered (Level B harassment) [16 U.S.C. 1362 (18)(B)(i)(ii)].
- For purposes of MMPA compliance, exceeding the modeled exposure of 0.5 animals presumes a "take" and requires Navy Action Proponents to seek authorization from the appropriate regulatory agency.

For purposes of ESA compliance, effects of the action were analyzed to make a determination of effect for listed species (for example, no effect or may affect). The definitions used in making the determination of effect under Section 7 of the ESA are based on the USFWS and NMFS *Endangered Species Consultation Handbook* (USFWS and NMFS 1998), and recent NMFS Biological Opinions involving the same activities and many of the same species in the Pacific (e.g., NMFS 2008a, 2009b).

- "No effect" is the appropriate conclusion when a listed species or its designated critical habitat will not be affected, either because the species will not be present or because the project does not have any elements with the potential to affect the species or modify designated critical habitat. "No effect" does not include a small effect or an effect that is unlikely to occur.
- If effects are insignificant (in size) or discountable (extremely unlikely), a "may affect" determination is appropriate. Insignificant effects relate to the magnitude or extent of the impact (for example, they must be small and would not rise to the level of a take of a species).
- For ESA protected marine mammals, if quantitative analysis indicates a modeled exposure exceeds 0.05 protected marine mammals, then there is a presumption that the proposed activity "may affect" the protected marine mammal thus triggering consultation with the appropriate regulatory agency pursuant to reference.
- Discountable effects are those extremely unlikely to occur and based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

For purposes of ESA compliance relative to listed critical habitats and as noted previously, there is no designated critical habitat in the TMAA.

Collisions with Whales

Vessel collisions are an acknowledged source of mortality and injury to all large whales. A discussion of the information available regarding collisions or "ship strikes" as related to individual large whale species in the TMAA has been presented in Sections 3.8.3 and 3.8.4.

Under the preferred alternative and with regard to annual Navy vessel traffic, the Navy has proposed providing the flexibility to conduct (as required) a second summer exercise within the TMAA between 2010 and 2015. Within the maximum two summer exercises, the length of the exercise, the number of vessels, and the allotted at-sea time within the TMAA during an exercise will be variable between years. These variations cannot be predicted given unknowns including the availability of participants for the annual exercise(s), which is a direct result of factors such as Navy responses to real-world events (e.g., tactical deployments, disaster relief, humanitarian assistance, etc.), planned and unplanned deployments, vessel availability due to funding and maintenance cycles, and logistic concerns with conducting an exercise in the GOA. The Navy predicts, however, there will be no increase required in excess of two annual summer exercises as described for Alternative 2 over the course of the 2010 and 2015 timeframe such that it is unlikely increases in steaming days would occur during this time period.

The following paragraphs present a context and assessment for the potential for Navy ship strikes in the TMAA. Accurate data regarding vessel collisions with whales is difficult for several reasons but mainly due to a lack of mandatory reporting by vessels other than the U.S. Navy and Coast Guard (Navy and Coast Guard report all whale collisions to NMFS as a standard procedure). As a result, historic trends, annual rates of collision, and, most importantly, the effect vessel collisions may have on particular stocks of whales or other marine mammals remain unknown.

The Navy requires reporting of all collisions involving marine mammals. While recognizing Navy activity in the TMAA has previously involved no more than an annual brief three-week period in the summer, there have been no known collisions, referred to as "ship strikes" by Navy surface ships or submarines in Alaska waters over many years of operation.

Reviews of the record, involving mostly commercial vessel collisions between ships and whales have been published (e.g., Laist et al. 2001, Jensen and Silber 2004). However, Navy vessel operations differ from commercial vessels in a number of ways important to the prevention of whale collisions. Navy surface ships maintain a constant, 24/7 navigation watch with dedicated lookouts while underway. The Navy has developed a Marine Species Awareness Training, which is required for all lookouts and is designed to recognize marine mammal cues to assist in avoiding potential collisions with whales. In addition to lookouts, there are often other watchstanders such as ship officers and supervisory personnel, as well as lookouts responsible for safe navigation and avoidance of in-water objects (marine mammals, other vessels, flotsam, marine debris, etc.). There are numerous reports from Navy transits and exercises in other locations involving the detection of whales with vessels subsequently proactively maneuvering to avoid a collision with a whale. For the safety of the crew, stewardship of marine mammals, and to avoid damage to vessels, the Navy does what it can to avoid ship strikes.

For Alaska waters, the available whale-vessel collision data has been presented in an unpublished preliminary summary (Gabriele et al. manuscript on file). The summary presents an opportunistically collected record containing reports of 62 whale-vessel collisions between 1978 and 2006 with most occurring in Southeast Alaska. This report is likely biased toward near shore reports and inland waters of Southeast Alaska where the authors were located and where nearshore vessels and a population of humpback whales overlap. Only one collision was recorded within the TMAA (involving a fishing vessel/sperm whale). As is evident from the Alaska record, most known collisions in Alaska waters involve humpback whales, although worldwide historical records indicate fin whales were the most likely species to be struck (Laist et al 2001). Most of the TMAA is above deep water and well offshore, which is not the preferred habitat for humpback whales, but is an area where fin whales or other species may certainly be present.

The following Navy requirements are intended to reduce the likelihood of a collision with whales for ships and surfaced submarines. Naval vessels will maneuver to keep at least 1,500 ft (500 yds) away from any observed whale in the vessel's path and avoid approaching whales head-on. These requirements do not apply if a vessel's safety is threatened, such as when change of course will create an imminent and serious threat to a person, vessel, or aircraft, and to the extent vessels are restricted in their ability to maneuver. Vessels will take all practicable steps to alert other vessels in the vicinity of the whale.

Given there are one to two submarines that may be operating in the TMAA and there is no known record of a marine mammal having ever collided with a submerged submarine, it is very unlikely this event would occur. For submerged submarines, if a marine mammal is vocalizing, then passive acoustic detection may provide information facilitating the avoidance of the marine mammal.

In summary, fin, humpback and other large whales may be present in the TMAA, but the sparse available data on whale-vessel collisions indicates that collisions are unlikely overall. The risk of collision is further reduced by the short duration of the exercise, Navy protocols for maintaining a lookout at all times, and maneuvering to avoid whales when possible. Given these factors, it is unlikely that Navy training activities in the TMAA would result in a collision with a whale.

3.8.7.8 No Action Alternative

Vessel Movements

Overview

Many of the ongoing and proposed activities within the TMAA involve maneuvers by various types of surface ships, boats, and submarines (collectively referred to as vessels). Under the No Action Alternative there would be four military combatant surface ships participating in training activities plus up to approximately 19 contracted fishing vessels. Potential variations in these maximum number of vessels participating cannot be predicted given unknowns including the availability of vessels for the annual exercise(s), which is a direct result of factors such as Navy responses to real-world events (e.g., tactical deployments, disaster relief, humanitarian assistance, etc.), planned and unplanned deployments, vessel availability due to funding and maintenance cycles, and logistic concerns with conducting an exercise in the GOA.

Disturbance Associated with Vessel Movements

Vessel movements have the potential to affect marine mammals by directly striking or disturbing individual animals. The probability of vessel and marine mammal interactions occurring in the TMAA is dependent upon several factors including numbers, types, and speeds of vessels; the regularity, duration, and spatial extent of activities; the presence/absence and density of marine mammals; and protective measures implemented by the Navy. During training activities, speeds vary and depend on the specific training activity. In general, Navy vessels will move in a coordinated manner but separated by many miles in distance. These activities are widely dispersed throughout the TMAA, which is a vast area encompassing 42,146 nm^2 (145,458 km^2). Consequently, the density of Navy vessels within the TMAA at any given time is extremely low.

Marine mammals are frequently exposed to vessels traffic as a result of commercial fishing activities, research, ecotourism, commercial and private vessel traffic. The presence of vessels has the potential to alter the behavior patterns of marine mammals. It is difficult to differentiate between responses to vessel sound and visual cues associated with the presence of a vessel; thus, it is assumed that both play a role in prompting reactions from animals (NMFS 2008a). Anthropogenic sound has increased in the marine environment over the past 50 years as a result of increased vessel traffic, marine dredging and construction, oil and gas drilling, geophysical surveys, sonar, and at-sea explosions (Richardson et al. 1995, NRC 2003b). Vessel strikes are rare, but do occur and can result in injury (NMFS 2008a).

Marine mammals react to vessels in a variety of ways and seem to be generally influenced by the activity the marine mammal is engaged in when a vessel approaches (Richardson et al. 1995). Some respond negatively by retreating or engaging in antagonistic responses while other animals ignore the stimulus altogether (Watkins 1986, Terhune and Verboom 1999). The ESA-listed marine mammal species (blue, fin, humpback, North Pacific right, sei, and sperm whales; and Steller sea lion) that occur in the TMAA are not generally documented to approach vessels in their vicinity. The predominant reaction is either neutral or avoidance behavior, rather than attraction behavior. If available, additional information regarding each listed species is provided below.

Blue and Sei Whales

There is little information on blue whale or sei whale response to vessel presence (NMFS 1998a, 1998b). Sei whales have been observed ignoring the presence of vessels and passing close to the vessel (Weinrich et al. 1986). The response of blue and sei whales to vessel traffic is assumed to be similar to that of the other baleen whales, ranging from avoidance maneuvers to disinterest in the presence of vessels. Any behavioral response would be short-term in nature.

Fin and Humpback Whales

Fin whales have been observed altering their swimming patterns by increasing speed, changing their heading, and changing their breathing patterns in response to an approaching vessel (Jahoda et al. 2003). Observations have shown that when vessels remain 328 ft (100 m) or farther from fin and humpback whales, they were largely ignored (Watkins et al. 1981). Only when vessels approached more closely did the fin whales in the study altered their behavior by increasing time at the surface and engaging in evasive maneuvers. The humpback whales did not exhibit any avoidance behavior (Watkins et al. 1981). However, in other instances humpback whales did react to vessel presence. In a study of regional vessel traffic, Baker et al. (1983) found that when vessels were in the area, the respiration patterns of the humpback whales changed. The whales also exhibited two forms of behavioral avoidance when vessels were between 0 and 6,562 ft (2,000 m) away (Baker et al. 1983): 1) horizontal avoidance (changing direction and/or speed) when vessels were between 6,562 ft (2,000 m) and 13,123 ft (4,000 m) away, or 2) vertical avoidance (increased dive times and change in diving pattern).

Based on existing studies, it is likely that fin and humpback whales would have little reaction to vessels that maintain a reasonable distance from the animals[6]. The distance that will provoke a response varies based on many factors including, but not limited to, vessel size, geographic location, and individual animal tolerance levels (Watkins et al. 1981, Baker et al. 1983, Jahoda et al. 2003). Should the vessels approach close enough to invoke a reaction, animals may engage in avoidance behaviors and/or alter their breathing patterns. Reactions exhibited by the whales would be temporary in nature. They would be expected to return to their pre-disturbance activities once the vessel has left the area.

North Pacific Right Whales

Although very little data exists examining the relationship between vessel presence and significant impact to North Pacific right whales, it is thought that any disturbance impacts would be minor and/or temporary in nature (NMFS 2005). In the North Pacific, ship strikes may pose a potential threat to North Pacific right whales. However, because of their rare occurrence and scattered distribution, it is impossible to assess the threat of ship strikes to this species at this time. For these reasons, NMFS has not identified ship collisions as major threat because the estimated annual rate of human-caused mortality and serious injury appears minimal (NMFS: http://www.nmfs.noaa.gov/pr/species/mammals/cetaceans/rightwhale_northpacific.htm, accessed May 30, 2008). Through 2002, there were no reports of ship strikes of North Pacific right whales by large ships along the U.S. West Coast and Canada (Jensen and Silber 2003). In addition, North Pacific right whales are protected through measures such as the 500-yard (1,500-m) no-approach limit, which affords them additional protection and further alleviates any effect vessel traffic might have on behavior or distribution (NMFS 1997).

Sperm Whale

Sperm whales generally show little to no reaction to ships, except on close approaches (within several hundred meters); however, some did show avoidance behavior such as quick diving (Würsig et al. 1998). In addition, in the presence of whale watching and research boats, changes in respiration and echolocation patterns were observed in male sperm whales (Richter et al. 2006). Disturbance from boats did not generally result in a change in behavior patterns and is short-term in nature (Magalhães et al. 2002).

Killer Whale

In Washington and British Columbia beginning in the late 1970s, whale watching involving mainly killer whales has become an important regional tourist industry. Both commercial and private vessels engage in whale watching. The number of vessels engaged in this activity increased from a few boats and fewer

[6] Regulations governing approach distances to humpback whales in Alaska waters were promulgated by NMFS in 2001 (NOAA 2001b).

than 1,000 passengers annually in the early 1980s to about 41 companies with 76 boats and more than 500,000 passengers annually in 2006 (Koski 2007). The growth of whale watching during the past 20 years has meant that killer whales in the region are experiencing increased exposure to vessel traffic. Not only do greater numbers of boats accompany the whales for longer periods of the day, but there has also been a gradual lengthening of the viewing season. Several studies have linked vessels with short-term behavioral changes in northern and southern resident killer whales (Kruse 1991, Kriete 2002, Williams et al. 2002, Bain et al. 2006), although whether it is the presence and activity of the vessel, the sounds of the vessel or a combination these factors is not well understood. Individual whales have been observed to react in a variety of ways to whale-watching vessels. Responses include swimming faster, adopting less predictable travel paths, making shorter or longer dives, moving into open water, and altering normal patterns of behavior at the surface (Kruse 1991, Williams et al. 2002, Bain et al. 2006), while in some cases, no disturbance seems to occur. Avoidance tactics often vary between encounters and the sexes, with the number of vessels present and their proximity, activity, size, and "loudness" affecting the reaction of the whales (Williams et al. 2002). Avoidance patterns often become more pronounced as boats approach closer.

The potential impacts of whale watching on killer whales remain controversial and inadequately understood. Although numerous short-term behavioral responses to whale watching vessels have been documented, no studies have yet demonstrated a long-term adverse effect from whale watching on the health of any killer whale population in the northeastern Pacific (NMFS 2008a). There are no reported instances of killer whale strikes, mortality, or injury reported because of these vessel activities (NMFS 2008a).

Delphinids

Species of delphinids can vary widely in their reaction to vessels. Many exhibit mostly neutral behavior, but there are frequent instances of observed avoidance behaviors (Hewitt 1985, Würsig et al. 1998). In addition, approaches by vessels can elicit changes in behavior, including a decrease in resting behavior or change in travel direction (Bejder et al. 2006). Alternately, many of the delphinid species exhibit behavior indicating attraction to vessels. This can include solely approaching a vessel (observed in harbor porpoises and minke whales) (David 2002), but many species such as common, rough-toothed and bottlenose dolphins are frequently observed bow riding or jumping in the wake of a vessel (Norris and Prescott 1961, Shane et al. 1986, Würsig et al. 1998, Ritter 2002). While this is also a regular occurrence wit Navy vessels, in the past, this also occurred when Navy vessels when using mid-frequency active sonar (current mitigation measures now preclude this from occurring). These behavioral alterations are short-term and would not result in any lasting effects.

Summary

If vessel traffic related to the proposed activity passed near marine mammals, this would only occur on an incidental basis. Most of the studies mentioned previously examine the reaction of animals to vessels that approach and intend to follow or observe an animal (i.e., whale watching vessels, research vessels, etc.). Reactions to vessels not pursuing the animals, such as those transiting through an area or engaged in training exercises, may be similar but would likely result in less stress to the animal because they would not intentionally approach animals. In fact, Navy mitigation measures include several provisions to avoid approaching marine mammals (see Section 5.1.7 for a detailed description of mitigation measures). As previously noted, all quick avoidance maneuvers are short-term alterations and not expected to permanently impact an animal. Most studies have ascertained the short-term response to vessel sound and vessel traffic (Watkins et al. 1981, Baker, et al. 1983, Magalhães et al. 2002); however, the long-term implications of ship sound on marine mammals is largely unknown (NMFS 2007a).

Marine mammals exposed to a passing Navy vessel may not respond at all, or they could exhibit a short-term behavioral response, but not to the extent where natural behavioral patterns would be abandoned or significantly altered. Human disturbance to wild animals may elicit similar reactions to those caused by natural predators (Gill et al. 2001, Beale and Monaghan 2004). Behavioral responses may also be accompanied by a physiological response (Romero 2004), although this is very difficult to study in the wild. Short-term exposures to stressors result in changes in immediate behavior (Frid 2003). Repeated exposure to stressors, including human disturbance such as vessel disturbance and anthropogenic sound, can result in negative consequences to the health and viability of an individual or population. Chronic stress can result in decreased reproductive success (Lordi et al. 2000, Beale and Monaghan 2004), decreased energy budget (Frid 2003), displacement from habitat (Sutherland and Crockford 1993), and lower survival rates of offspring (Lordi et al. 2000). At this time, it is unknown what the long-term implications of chronic stress may be on marine mammal species.

Vessel movements under the No Action Alternative are not expected to result in chronic stress because, as discussed above, Navy vessel density in the TMAA would remain low and the Navy implements mitigation measures to avoid marine mammals. General disturbance associated with vessel movements may affect ESA-listed marine mammals. It is not likely that disturbance associated with vessel movements during training activities would result in effects to the life functions of marine mammals in the TMAA. This same disturbance is not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, harm to marine mammals from vessel disturbance in nonterritorial seas (seaward of 12 nm [22 km]) would be minimal. The Navy is working with NMFS through the ESA consultation and MMPA permitting processes accordingly.

Vessel Collisions with Marine Mammals

Based on the implementation of Navy mitigation measures and the relatively low density of Navy ships in the TMAA, it is very unlikely that a vessel collision would occur under the No Action Alternative. It is therefore unlikely that vessel movements associated with training activities would result in effects to the life functions of marine mammals in the TMAA. Because the possibility cannot be categorically dismissed, a vessel collision may affect large whales (mysticetes and sperm whales) in the TMAA. Vessel movement may affect Steller sea lions but collisions are not likely. There are no training activities taking place in territorial seas (shoreline to 12 nm [22 km]). Vessel collisions in nonterritorial seas (seaward of 12 nm [22 km]) are not anticipated and would not cause significant harm to marine mammal stocks or populations in accordance with EO 12114. The Navy is working with NMFS through the ESA consultation and MMPA permitting processes accordingly.

Aircraft Overflights

Overview

Various types of fixed-wing aircraft and helicopters are used in training exercises throughout the TMAA. These aircraft overflights would produce airborne noise and some of this energy would be transmitted into the water. Marine mammals could be exposed to noise associated with subsonic and supersonic fixed-wing aircraft overflights and helicopter activities while at the surface or while submerged. In addition to sound, marine mammals could react to the shadow of a low-flying aircraft and/or, in the case of helicopters, surface disturbance from the downdraft.

Transmission of sound from a moving airborne source to a receptor underwater is influenced by numerous factors and has been addressed by Urick (1972), Young (1973), Richardson et al. (1995), Eller and Cavanagh (2000), Laney and Cavanagh (2000), and others. Sound is transmitted from an airborne source to a receptor underwater by four principal means:

- Direct path, refracted upon passing through the air-water interface;

- Direct-refracted paths reflected from the bottom in shallow water;
- Lateral (evanescent) transmission through the interface from the airborne sound field directly above; and
- Scattering from interface roughness due to wave motion.

Aircraft sound is refracted upon transmission into water because sound waves move faster through water than through air (a ratio of about 0.23:1). Based on this difference, the direct sound path is totally reflected if the sound reaches the surface at an angle more than 13 degrees from vertical. As a result, most of the acoustic energy transmitted into the water from an aircraft arrives through a relatively narrow cone with a 26 degree apex angle extending vertically downward from the aircraft (Figure 3.8-13). The intersection of this cone with the surface traces a "footprint" directly beneath the flight path, with the width of the footprint being a function of aircraft altitude.

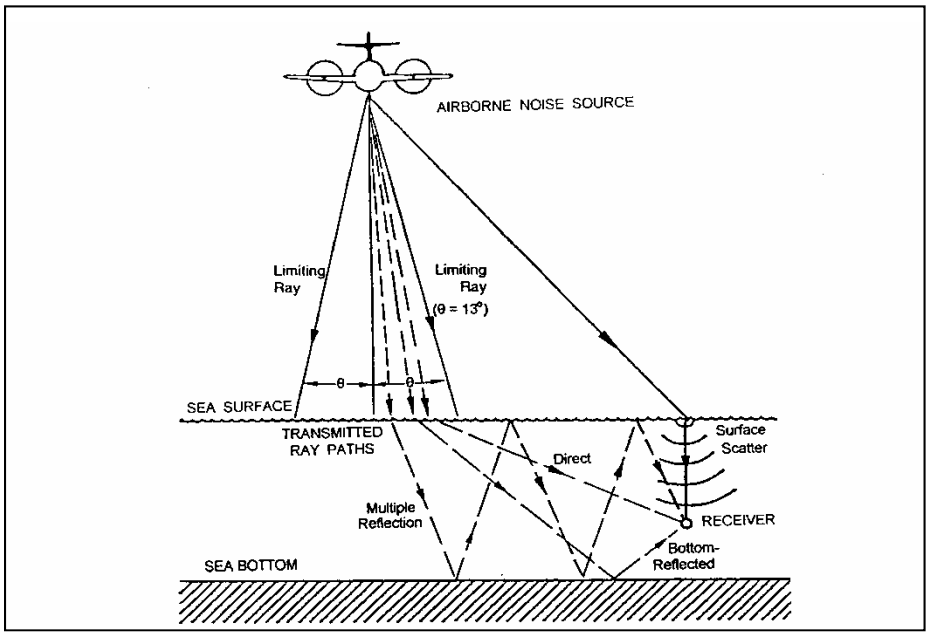


Figure 3.8-13: Characteristics of Sound Transmission through Air-Water Interface

The sound pressure field is actually doubled at the air-to-water interface because the large difference in the acoustic properties of water and air. For example, a sonic boom with a peak pressure of 10 pounds per square foot (48.8 kg/square meter [m^2]) at the sea surface becomes an impulsive wave in water with a maximum peak pressure of 20 pounds per square foot (97.6 kg/m^2). The pressure and sound levels then decrease with increasing depth.

Eller and Cavanagh (2000) modeled estimates of SPL as a function of time at selected underwater locations (receiver animal depths of 7 ft [2 m], 33 ft [10 m], and 164 ft [50 m]) for F-18 aircraft subsonic overflights (250 knots [463 km/hr]) at various altitudes (984 ft [300 m], 3,281 ft [1,000 m], and 9,842 ft [3,000 m]). As modeled for all deep water scenarios, the sound pressure levels ranged from approximately 120 to 150 dB re 1 μPa] in water. They concluded that it is difficult to construct cases (for any aircraft at any altitude in any propagation environment) for which the underwater sound is sufficiently intense and long lasting to cause harm to any form of marine life.

The maximum overpressures calculated for FA-18 aircraft supersonic overflights range from 5.2 pounds per square foot (psf) (25.4 kg/m^2) at 10,000 ft (3,048 m) to 28.8 psf (140.6 kg/m^2) at 1,000 ft (305 m) (Ogden 1997). Considering an extreme case of a sonic boom that generates maximum overpressure of 50 psf (244.1 kg/m^2) in air, it would become an impulsive wave in water with a maximum peak pressure of 100 psf (488.2 kg/m^2) or about 0.7 psi (0.05 kg/cm^2). Therefore, even a worst-case situation for sonic booms would produce a peak pressure in water well below the level that would cause harassment or injury to marine mammals (Laney and Cavanagh, 2000).

Fixed-Wing Aircraft Overflights

Approximately 300 fixed-wing sorties would occur in the TMAA annually under the No Action and Alternative 1. Many of these sorties will generally take place above 30,000 ft (9,144 m). All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m) and have no effect on marine mammals. While fixed-wing aircraft activities can occur in Special Use Airspace throughout the Alaska Training Area, a majority of the sorties are associated with Navy Air Combat Maneuver (ACM) training, will take place in the TMAA. Under the No Action Alternative, approximately 300 ACM sorties would occur annually (average of 21 sorties per day). Altitudes range from approximately 6,000 ft (1,920 m) to 30,000 ft (9,144 m) and typical airspeeds range from very low (less than 100 knots [185.2 km/hr]) to high subsonic (less than 600 knots [1,111.2 km/hr]). ACM training in the TMAA will also involve supersonic flight which produces sonic booms, but this would not occur below 15,000 ft (4,572 m) AMSL.

Exposure to fixed-wing aircraft noise would be brief (seconds) as an aircraft quickly passes overhead. Exposures would be infrequent based on the transitory and dispersed nature of the overflights; repeated exposure to individual animals over a short period of time (hours or days) is extremely unlikely. Furthermore, the sound exposure levels would be relatively low to marine mammals that spend the majority of their time underwater.

Most observations of cetacean responses to aircraft overflights are from aerial scientific surveys that involve aircraft flying at relatively low altitudes and low airspeeds. It should be noted that most of the aircraft overflight exposures analyzed in the studies mentioned above are different than Navy aircraft overflights. Survey and whale watching aircraft are expected to fly at lower altitudes than typical Navy fixed-wing overflights. Exposure durations would be longer for aircraft intending to observe or follow an animal. These factors might increase the likelihood of a response to survey or whale watching aircraft.

Mullin et al. (1991) reported that sperm whale reactions to aerial survey aircraft (standard survey altitude of 750 ft [229 m]) were not consistent. Some sperm whales remained on or near the surface the entire time the aircraft was in the vicinity, while others dove immediately or a few minutes after the sighting.

Smultea et al. (2001) reported that a group of sperm whales responded to a circling aircraft (altitude of 800 ft [244 m] to 1,100 ft [335 m]) by moving closer together and forming a fan-shaped semi-circle with their flukes to the center and their heads facing the perimeter. Several sperm whales in the group were observed to turn on their sides, to apparently look up toward the aircraft. Richter et al. (2003) reported that the number of sperm whale blows per surfacing increased when recreational whale watching aircraft were present, but the changes in ventilation were small and probably of little biological consequence. The presence of whale watching aircraft also apparently caused sperm whales to turn more sharply, but did not affect blow interval, surface time, time to first click, or the frequency of aerial behavior (Richter et al. 2003). A review of behavioral observations of baleen whales indicates that whales will either demonstrate no behavioral reaction to an aircraft or, occasionally, display avoidance behavior such as diving (Koski et al. 1998). Smaller delphinids also generally display a neutral or startle response (Würsig et al. 1998). Species, such as *Kogia* spp. and beaked whales, that show strong avoidance behaviors with ship traffic, also exhibit disturbance reactions to aircraft (Würsig et al. 1998). Although there is little information

regarding reactions to aircraft overflights for other cetacean species, it is expected that reactions would be similar to those described above; either no reaction or quick avoidance behavior.

Marine mammals exposed to a low-altitude fixed-wing aircraft overflights could exhibit a short-term behavioral response, but not to the extent where natural behavioral patterns would be abandoned or significantly altered. Fixed-wing aircraft overflights are not expected to result in chronic stress because it is extremely unlikely that individual animals would be repeatedly exposed to low altitude overflights. Fixed-wing aircraft overflights may affect ESA-listed marine mammals. It is not likely that aircraft overflights associated with training activities would result in effects to the life functions of marine mammals in the TMAA. This same disturbance is not expected to result in Level A or Level B harassment as defined by the MMPA. High-altitude fixed-wing aircraft overflights over nonterritorial seas (seaward of 12 nm [22 km]) would not cause significant harm to marine mammals in accordance with EO 12114. The Navy is working with NMFS through the ESA consultation and MMPA permitting processes accordingly.

Helicopter Overflights

Approximately 32 training events could involve helicopters in the TMAA annually under the No Action Alternative. Helicopter overflights can occur throughout the TMAA. Unlike fixed-wing aircraft, helicopter training activities can occur at low altitudes (75 ft [23 m] to 100 ft [30 m]), which increases the likelihood that marine mammals would respond to helicopter overflights. However, the only places that helicopters are below 500 ft [152 m] above ground level (AGL) over water is during training when personnel jump from the helicopter into water from 75 ft [23 m] to 100 ft [30 m] above the surface, when doing Deck Landing Qualifications, or when using dipping sonar. Otherwise, helicopters are 500 ft [152 m] AGL or higher while in transit. There are no haul outs or rookeries in the TMAA and none of these overflight activities in the TMAA would take place near a haul out or rookery location.

Very little data are available regarding reactions of cetaceans to helicopters. One study observed that sperm whales showed no reaction to a helicopter until the whales encountered the downdrafts from the helicopter rotors (Clarke 1956). Other species such as bowhead whale and beluga whales show a range of reactions to helicopter overflights, including diving, breaching, change in direction or behavior, and alteration of breathing patterns, with belugas exhibiting behavioral reactions more frequently than bowheads (Patenaude et al. 2002). These reactions were less frequent as the altitude of the helicopter increased to 492 ft (150 m) or higher.

Helicopters are used in studies of several species of seals hauled out and is considered an effective means of observation (Gjertz and Børset 1992, Bester et al. 2002, Bowen et al. 2006), although they have been known to elicit behavioral reactions such as fleeing (Hoover 1988). Jehl and Cooper (1980) indicated that low-flying helicopters, humans on foot, sonic booms, and loud boat noises were the most disturbing influences to pinnipeds. In other studies, harbor and other species of seals and sea lions showed no reaction to helicopter overflights (Gjertz and Børset 1992). Among the pinnipeds, harbor seals are the most likely to startle; no serious disturbance was recorded among northern elephant seals. Numerous observations of marine mammal reactions (or lack of reaction) to aircraft have been reported. In most cases, airborne or waterborne noise from aircraft was the apparent stimulus (Richardson et al. 1995). Other studies have shown less drastic reactions. Hoover (1988) reported strong reactions to aircraft below 200 ft (61 m), but minimal reaction to aircraft above 250 ft (76 m). Other studies have suggested that harbor seals can become sensitized to overflights and show little or no reaction after frequent exposure (Frost and Lowry 1993). Harbor seals have been noted to react to aircraft flyovers when on the beach, however, Navy fixed wing aircraft would be at high altitude over harbor seal haul out locations and within established air transit routes. In the case of helicopter flyovers of less than 393 ft (120 m), mothers have abandoned newborn pups and retreated into the water. This behavior can result in permanent separation of

newborn pups and subsequent death (Johnson 1967). Helicopters overflights of rookeries would not occur in the TMAA as there are no haul out locations within the TMAA.

If animals do flush into the water, they may return to the haul-out site immediately, stay in the water for a length of time and then return to the haul-out, or temporarily haul-out at another site. Many factors contribute to the degree of behavioral modification, if any, including seasonality, group composition of the pinnipeds, type of activity they are engaged in, and noises they may be accustomed to experiencing. Short-term reactions such as startle or alert reactions are not likely to disrupt behavior patterns such as migrating, breeding, feeding and sheltering, nor would they be likely to result in serious injury to marine mammals. However, if startle reactions were accompanied by large-scale movements of marine mammals, such as stampedes into the water, the disruption could result in injury of individuals, especially if pups were present.

Marine mammals exposed to a low-altitude helicopter overflights under the No Action Alternative could exhibit a short-term behavioral response, but not to the extent where natural behavioral patterns would be abandoned or considerably altered. Helicopter overflights are not expected to result in chronic stress because it is extremely unlikely that individual animals would be repeatedly exposed. Helicopter overflights can occur throughout the TMAA, but will not be in close proximity land and therefore far from known haul out areas and established rookeries. In addition, the Navy complies with restrictions prohibiting fixed wing aircraft or helicopter overflight or surface training activities within 3,000 ft (914 m) of Steller sea lion critical habitat (NMFS 1993), rookeries or pinniped haulout areas (DoN 2002). These mitigation measures minimize adverse reactions of seals and Steller sea lions to training activities.

As such, helicopter overflights in the TMAA may affect ESA-listed marine mammals. These overflights are not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that helicopter flights associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, harm to marine mammals from helicopter overflights over nonterritorial seas (seaward of 12 nm [22 km]) would be minimal. The Navy is working with NMFS through the ESA consultation and MMPA permitting processes accordingly.

Non-explosive Practice Ordnance

Current Navy training activities include firing a variety of weapons that employ a variety of non-explosive training rounds, including naval gun shells, cannon shells, and small caliber ammunition. As part of this training, Navy regulations require visual clearance before the training exercise of any range where ordnance (including non-explosive inert practice ordnance) is to be dropped. This analysis focuses on non-explosive training rounds, while potential effects of explosive munitions in the water are analyzed below in the explosions section. Missiles used in air to air training events at sea, although part of a live fire event, are designed to detonate in the air and do not constitute an at-sea explosion occurring in water as analyzed in this document.

The number of non-explosive practice ordnance events by type of projectile occurring for the No Action Alternative is presented in Table 2-8. Non-explosive practice ordnance includes naval gunshells (20mm, 25mm, 57mm, 76mm, and 5-inch projectiles) and small arms rounds (7.62mm and .50-caliber projectiles). Annually, there would be about 10,524 inert naval gunshells and about 5,000 small arms projectiles expended into the ocean with the No Action Alternative.

Direct ordnance strikes and disturbance associated with sound from firing are potential stressors to other listed marine mammals. Ingestion of expended ordnance is not a potential concern for marine mammals given it should sink to the ocean floor very quickly.

The potential for marine mammals to be struck by fired ordnance is extremely low given the density of marine mammals in the TMAA and the rapid loss of velocity once entering the water. The probability of a direct ordnance strike is further reduced by Navy mitigation measures, which require the area be clear of marine mammals before ordnance is used (see Section 5.1.7). Non-explosive ordnance may affect marine mammals although it is not likely that use of non-explosive ordnance associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance EO12114, non-explosive ordnance use in nonterritorial seas (seaward of 12 nm [22 km]) would not cause significant harm to marine mammals.

Weapons Firing Disturbance

Transmitted Gunnery Sound

A gun fired from a ship on the surface of the water propagates a blast wave away from the gun muzzle. This spherical blast wave reflects off and diffracts around objects in its path. As the blast wave hits the water, it reflects back into the air, transmitting a sound pulse back into the water in proportions related to the angle at which it hits the water.

Propagating energy is transmitted into the water in a finite region below the gun. A critical angle (about 13°, as measured from the vertical) can be calculated to determine the region of transmission in relation to a ship and gun (DoN 2006).

The largest proposed shell size for these activities is a 5-inch shell. This will produce the highest pressure and all analysis will be done using this as a conservative measurement of produced and transmitted pressure, assuming that all other smaller ammunition sizes would fall under these levels.

Aboard the USS Cole in June 2000, a series of pressure measurements were taken during the firing of a five-inch gun. Average pressure measured approximately 200 decibels (dB) with reference pressure of one micro Pascal (dB re 1 µPa) at the point of the air and water interface. Based on the USS Cole data, down-range peak pressure levels were calculated to be less than 186 dB re 1 µPa at 328 ft (100 m) (DoN 2000) and as the distance increases, the pressure would decrease.

In reference to the energy flux density (EFD) harassment criteria, the EFD levels (greatest in any 1/3 octave band above 0.01 kHz) of a 5-inch gun muzzle blast were calculated to be 190 dB with reference pressure of one micropascal squared in one second (dB re 1 μPa^2-sec) directly below the gun muzzle decreasing to 170 dB re 1 μPa^2-sec at 328 ft (100 m) into the water (DoN 2006). The rapid dissipation of the sound pressure wave coupled with the mitigation measures implemented by the Navy (see Section 5.1.7 for details) to detect marine mammals in the area prior to conducting activities, would likely result in a blast from a gun muzzle having no effect, however, the sound from gunfire may affect marine mammal species listed under the ESA. In with EO 12114, there would be no significant harm to marine mammals resulting from transmitted gunnery sound during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

Sound Transmitted Through Ship Hull

A gun blast will also transmit sound waves through the structure of the ship which can propagate into the water. The 2000 study aboard the USS Cole also examined the rate of sound pressure propagation through the hull of a ship (DoN 2000). The structurally borne component of the sound consisted of low-level oscillations on the pressure time histories that preceded the main pulse, due to the air blast impinging on the water (DoN 2006).

The structural component for a standard round was calculated to be 6.19 percent of the air blast (DoN 2006). Given that this component of a gun blast was a small portion of the sound propagated into the

water from a gun blast, and far less than the sound from the gun muzzle itself, the transmission of sound from a gun blast through the ship's hull may affect species listed under the ESA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from sound transmitted through a ship hull during training exercises in nonterritorial seas (seaward of 12 nm [22 km]). Furthermore, performing visual clearance of the range prior to conducting training exercises further reduce the likelihood of practice ordnance hitting marine mammals.

Explosive Ordnance and At-Sea Explosions

The number of high explosive events by type of ordnance occurring for the No Action Alternative is presented in Table 2-8. In addition to 30 5-inch and 10 76mm live rounds, a total of 48 high-explosive bombs (MK-82, MK-83 and MK-84 types) will be detonated in the water annually.

The modeled explosive exposure harassment numbers by species (as derived using the methods described in Section 3.8.6.5) and harassment exposures for rare species (few in number in the TMAA) are presented in Table 3.8-9. The table quantifies MMPA Level B harassment from behavioral disturbance and MMPA Level A harassment from potential injury to marine mammals.

For at-sea explosions under the No-Action Alternative, quantification from modeling, accounting for rare species for which modeling was not possible, and for which modeling provided an estimate of zero exposures, indicates 80 MMPA Level B harassments from sub-TTS for MSE. The modeling indicates 22 MMPA Level B harassments from TTS. Under the No Action Alternative from at-sea explosions, quantification from modeling and accounting for rare species indicates a total of 102 MMPA Level B harassments annually.

These exposure modeling results are estimates of marine mammal at-sea explosion sound exposures without consideration of standard operating procedures and mitigation procedures. The implementation of the mitigation presented in Section 5.2.1 will reduce the potential occurrence for some of these modeled marine mammal exposures and harassments as a result of area clearance procedures (NMFS 2008a). For example, modeling for at-sea explosions under the No Action Alternative also indicates potential for one MMPA Level A harassment from slight injury and no annual exposures that could cause severe injury or mortality. This slight injury exposure should not occur given it is predicted for Dall's porpoise, which should be readily detectable given the species general large group size and characteristic porpoising behavior.

Without consideration of mitigation measures, modeling and accounting for rare species indicates at-sea explosion exposures with the No Action Alternative may affect ESA listed blue, fin, humpback, North Pacific right, sei, and sperm whales, and Steller sea lions. Although modeling was not possible for rare species as defined in this analysis, it is unlikely these few animals would co-occur in the TMAA during the short duration of the training and in areas cleared of marine mammals.

The implementation of the mitigation and monitoring procedures as addressed in Section 5.1.7 will further minimize the potential for marine mammal exposures to at-sea explosions. When reviewing the acoustic exposure modeling results, it is also important to understand that the estimates of marine mammal exposures are presented without consideration of standard protective measure operating procedures. Section 5.1.7 presents details of the mitigation measures currently used for ASW activities including detection of marine mammals and power down procedures if marine mammals are detected within one of the safety zones. The Navy will work through the MMPA incidental harassment regulatory process to discuss the mitigation measures and their potential to reduce the likelihood for incidental harassment of marine mammals. It is not likely that any exposures from training activities associated with at-sea explosions would result in effects to the life functions of marine mammals in the TMAA.

Table 3.8-9: No Action Alternative Annual At-Sea Explosions Exposures Summary

Species	Level B Harassment		Level A Harassment	Mortality
	Sub-TTS 177 dB re 1µPa^2-s	TTS 182 dB / 23 psi	50 percent TM Rupture 205 dB Slight Lung Injury or 23 psi-ms	Onset massive Lung Injury or Mortality 31 psi-ms
ESA Species				
Blue whale	1*	0	0	0
Fin whale	5	3	0	0
Humpback whale	2*	0	0	0
North Pacific Right whale	1*	0	0	0
Sei whale	4*	0	0	0
Sperm whale	1*	0	0	0
Steller sea lion	1	0	0	0
Non-ESA Listed Species				
Baird's beaked whale	11*	0	0	0
Cuvier's beaked whale	1	0	0	0
Dall's porpoise	29	13	1	0
Gray whale	3*	0	0	0
Harbor Porpoise	2*	0	0	0
Killer whale	1	0	0	0
Minke whale	2*	0	0	0
Pacific white-sided dolphin	3	2	0	0
Stejneger's beaked whale	1	0	0	0
California sea lion	1*	0	0	0
Harbor seal	1*	0	0	0
Northern elephant seal	1	0	0	0
Northern fur seal	9	4	0	0
Total	**80**	**22**	**1**	**0**

Notes: dB = decibel, dB re 1µPa^2-s = decibels referenced to 1 micropascal squared per second, ESA = Endangered Species Act, psi = pound per square inch, psi-ms = pounds per square inch per millisecond, PTS = Permanent Threshold Shift, TM = Tympanic membrane, TTS = Temporary Threshold Shift; * = Accounting for rare animals.

Active Sonar

There would be no effects to marine mammals from active sonar for the No Action Alternative. For the No Action Alternative, there is no use of active sonar for ASW Training, no ASW Tracking Exercise – Maritime Patrol Aircraft, Extended Echo Ranging (EER) ASW, Surface Ships ASW, or Submarine ASW TRACKEX.

Expended Materials

The Navy expends a variety of materials during training exercises. Under the No Action Alternative, 15,982 expendable items may be used. The types and quantities of materials expended and information regarding fate and transport of these materials within the marine environment are discussed in Section 3.2 (Expended Materials), and Section 3.3 (Water Resources). The analyses in these sections determined that

most expended materials rapidly sink to the seafloor where they become encrusted by natural processes or are incorporated into the seafloor, with no substantial accumulations in any particular area and no significant negative effects to water quality or marine benthic communities. Given that materials expended during training do not remain at the surface and are generally used in areas where the water depth is beyond that of foraging marine mammals, it is unlikely expended materials would be later encountered by any marine mammal.

Ordnance Related Materials

Ordnance related materials include various sizes of non-explosive training rounds and shrapnel from explosive rounds. Under the No Action Alternative, 15,706 items of ordnance or related materials would be expended. These solid metal materials would quickly move through the water column and settle to the sea floor. These materials would become encrusted by natural processes and incorporated into the seafloor, with no significant accumulations in any particular area and no negative effects to water quality. Ingestion of expended ordnance is not expected to occur in the water column because it is assumed the ordnance (which is composed of dense metal) would quickly sink. However, benthic foraging marine mammals could be exposed to expended ordnance through ingestion. Some materials such as an intact non-explosive training bomb would be too large to be ingested by a marine mammal, but many materials such as cannon shells, small caliber ammunition, and shrapnel could be ingested. Records indicate that generally metal debris ingested by marine mammals is small (e.g., fishhooks, bottle caps, metal spring; Walker and Coe 1990). The effects of ingesting solid metal objects on marine mammals are unknown. Extensive literature searches reveal no studies related to potential toxic effects of ordnance ingestion by marine mammals. Ingestion of marine debris in general can cause digestive tract blockages or damage the digestive system (Stamper et. al. 2006, Gorzelany 1998). Relatively small objects with smooth edges such a cannon shell or small caliber ammunition might pass through the digestive tract without causing harm, while a piece of metal shrapnel with sharp edges would be more likely to cause damage.

The potential for ordnance ingestion depends on species-specific feeding habitats and where ordnance use will occur. The blue, fin, and sei whales and Steller sea lion feed at the surface or in the water column and would not ingest ordnance from the bottom. Activities involving ordnance use will most likely occur in the open ocean beyond the shelfbreak areas above in deep water (> 3,280 ft [1,000 m] depth).

While humpback whales feed predominantly by lunging through the water after krill and fish, there have been instances of humpback whales disturbing the bottom in an attempt to flush prey, the northern sand lance (*Ammodytes dubius*) (Hain et al. 1995). Right whales can also be bottom feeders, however, North Pacific right whales and Humpback whales are not expected to ingest ordnance because abundant prey is available in the water column in the TMAA. Ordnance ingestion under the No Action Alternative would have no effect on the ESA listed blue whales, fin whales, humpback whales, North Pacific right whales, sei whales, and Steller sea lions.

Although sperm whales feed predominantly on cephalopods, they also frequently feed on or near the bottom (Whitehead et al. 1992). In doing so, animals may ingest nonfood items such as rocks and sand (NMFS 2006a). Sperm whales are known to incidentally ingest foreign objects while foraging (Walker and Coe 1990), suggesting that the potential exists to ingest military expended material that has settled on the ocean floor as a result of the proposed activities. Sperm whales display a strong offshore preference (Rice 1989) and are mostly associated with waters over the continental shelf edge, continental slope, and offshore waters (CETAP 1982, Hain et al. 1985, Smith et al. 1996, Waring et al. 2001, Davis et al. 2002). Although the possibility exists for ingestion of expended ordnance, the potential that exposed ordnance would be at a depth where it could be encountered, that it would not be buried, and that in those very rare events the animal would ingest that ordnance creates so unlikely a series of events that the potential is discountable. Ordnance ingestion under the No Action Alternative under the ESA may affect sperm

whales. However, it is not likely that ordnance ingestion would result in effects to the life functions of marine mammals in the TMAA.

Most other nonlisted baleen and toothed whales, and other pinnipeds, which feed at the surface or in the water column, would not be expected to ingest ordnance from the bottom. Gray and beaked whales are, however, known to be bottom feeders. The habitat preference of gray whales with an occurrence being inshore of the shelfbreak, is not an area where ordnance use is likely to occur. Beaked whales have exhibited bottom feeding behavior using suction feeding techniques (MacLeod et al. 2003) and are known to incidentally ingest foreign objects while foraging (Walker and Coe 1990). Although the possibility exists for ingestion of expended ordnance, the potential that exposed ordnance would be encountered and that in that very rare event the animal would ingest that ordnance is discountable. Ordnance related materials are not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, ordnance related materials would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Target Related Materials

A variety of at-sea targets are used ranging from high-technology, remotely operated airborne and surface targets (such as airborne drones and Seaborne Powered Targets) to low-technology floating at-sea targets (such as inflatable targets) and towed banners. Many of the targets are designed to be recovered for reuse and are not destroyed during training. There are 64 target related items used under the No Action Alternative. The expendable targets used in the TMAA are the Tactical Air Launched Decoy (TALD), Killer Tomatoes, SPAR, BQM-74E unmanned aircraft, LUU-2B/B illuminating flares, and the MK-58 Marine Marker. Flares and Marine Markers are generally small in size, and sink to the bottom. Killer Tomatoes, SPAR, and BQM-74 are recovered after use. Killer Tomato target balloons are made of lightweight vinyl and measure 10x10x10 in size and weigh approximately 55 lb (25 kg). TALDs are approximately 7 ft (2 m) long and weigh approximately 400 lb (180 kg). Because of these characteristics, neither present an unlikely ingestion hazard to marine mammals.

As discussed above for ordnance-related materials, species that feed on or near the bottom (which are the sperm whales and beaked whales) may encounter an expended target while feeding; however, the size of the target would suggest ingestion by any listed species it is unlikely. The use of targets under the No Action Alternative may affect listed marine mammals. It is not likely that use targets associated with training activities would result in effects to the life functions of marine mammals in the TMAA. Targets are not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, targets would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Chaff

As detailed in Section 3.2.1.1, chaff consists of aluminum-coated fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor.

Chaff will only be used during Electronic Combat (EC) exercises and mainly by fixed wing aircraft and as projectiles from ships. Under the No Action Alternative, 540 lb (245 kg) of chaff would be used annually. The only hazardous material associated with chaff is the pyrotechnic deployment charge (approximately 0.02 oz [0.48 g] of pyrotechnic material for each charge). Chaff consists of aluminum-coated polymer fibers inside of a launching mechanism. Upon deployment, the chaff and small pieces of plastic are expended. Chaff may be deployed mechanically or pyrotechnically. Mechanical deployment results in expended paper materials, along with the chaff. Pyrotechnic deployment uses a small explosive

cartridge to eject the chaff from a small tube that does not affect water or sediment quality because most of the material is consumed during combustion and the remaining amounts are be dispersed over a large area. Chaff fibers are widely dispersed on deployment. Chaff settling on the ocean surface may temporarily raise turbidity, but will quickly disperse with particles eventually settling to the ocean floor.

As first presented in DoN (2009), the dispersion characteristics of chaff make it likely that marine mammals would occasionally come in direct contact with chaff fibers while at the water's surface and while submerged, but such contact would be inconsequential. Chaff is similar in form to fine human hair with the fibers being flexible and soft. Evaluation of the potential for chaff to be inhaled by humans, livestock, and animals found that the fibers are too large to be inhaled into the lung (Arfsten et al. 2002, Hullar et al. 1999, USAF 1997). Although these reviews did not specifically consider the respiratory system of large whales, any effects of chaff inhalation on marine mammals are considered insignificant given the dispersal of chaff fibers resulting in very low concentration in the air.

While no studies have been conducted to evaluate the effects of chaff ingestion on marine mammals, the effects are expected to be insignificant and discountable based the low concentrations when dispersed, the small size of chaff fibers, available data on the toxicity of chaff components (silicon dioxide and aluminum), and evidence indicating the lack of significant accumulation of aluminum in sediments after prolonged training (DoN 2009). Silicon and aluminum are two of the most abundant elements in the earth's crust. Marine mammals, such as gray whales that forage on the bottom, routinely ingest sediment containing these elements. The aluminum concentrations in brain tissue of gray whales are within the range for terrestrial mammals that may receive high concentrations of aluminum in their diets, suggesting a broad range in tolerance to aluminum in mammals (Varanasi et al. 1993, Tilbury 2002, DoN 2009). Chaff cartridge plastic end-caps and pistons would also be expended into the marine environment, where they would sink and could potentially be ingested by marine mammals. Based on the low concentration of these components in the TMAA, it is very unlikely a marine mammal would encounter a plastic end-cap or piston from the chaff cartridge. Even in the very unlikely event one of these components was encountered and then consumed by a marine mammal, the small size of chaff end-caps and pistons (1.3 inch [33 mm] diameter and 0.13 inch [3.3 mm] thick) would suggest it would likely pass through the digestive tract and be voided without causing harm.

Under ESA, chaff use under the No Action Alternative may affect blue, fin, humpback, North Pacific right, sei, and sperm whales. Use of chaff is not expected to result in Level A or Level B harassment as defined by the MMPA and would not cause significant harm to marine mammals in non-territorial waters in accordance with EO 12114.

Marine Markers

The MK-58 marine marker produces chemical flames and regions of surface smoke and is used in various training exercises to mark a surface position to simulate divers, ships, and points of contact on the surface of the ocean. When the accompanying cartridge is broken, an area of smoke is released. The smoke dissipates in the air having little effect on the marine environment. The marker burns similar to a flare, producing a flame until all burn components have been used. While the light generated from the marker is bright enough to be seen up to 3 mi (5 km) away in ideal conditions, the resulting light would either be reflected off the water’s surface or would enter the water and attenuate in brightness over depth. The point source of the light would be focused and be less intense than if an animal were to look to the surface and encounter the direct path of the sun. The MK-58 is composed of tin and contains two red phosphorus pyrotechnic candles and a seawater-activated battery. The MK-58 marine marker is 22 inch (0.5 m) long and 5 inch (0.1 m) in diameter, weighs 13 lb (6 kg), and produces a yellow flame and white smoke for a minimum of 40 min and a maximum of 60 min (The Ordnance Shop 2007). The marker itself is not designed to be recovered and would eventually sink to the bottom and become encrusted and/or

incorporated into the sediments. Approximately 20 marine markers would be used in the TMAA per year under the No Action Alternative.

It is unlikely that marine mammals would be exposed to any chemicals that produce either flames or smoke because these components are consumed in their entirety during the burning process. Animals are unlikely to approach and/or get close enough to the flame to be exposed to any chemical components.

Expended marine markers are a potential ingestion hazard for marine mammals while they are floating or after they sink to the bottom. However, the probability of ingestion is extremely low based on the low number of marine markers expended per year (20) versus the large operational area of the TMAA. Marine marker ingestion under the No Action Alternative will not affect ESA-listed marine mammals. The use of marine markers is not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of marine markers associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of marine markers during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

Tactical Air Launched Decoys (TALDs)

Under the No Action Alternative, eight TALDs would be used annually. A TALD is an aircraft shaped target approximately 7 ft 8 in (2.3 m) long and weighs approximately 400 lb (180 kg). TALDs operate as an expendable vehicle with no recovery capabilities, and use lithium sulfur dioxide batteries. An important component of the thermal battery is a hermetically-sealed casing of welded stainless steel 0.03 to 0.1-in thick that is resistant to the battery electrolytes. As discussed in Section 3.2, in the evaluation of the potential effects associated with seawater batteries, it is expected that in the marine environment, lithium potentially released from these batteries would be essentially nontoxic in seawater. Because of these factors, lithium batteries would not adversely affect marine mammals.

Pieces of expended TALDS (if any) are a potential ingestion hazard for marine mammals after they sink to the bottom. However, the probability of ingestion is extremely low based on size of the likely pieces (if any) the low number of TALDS expended per year (8), and the large operational area of the TMAA. TALD ingestion under the No Action Alternative may affect ESA-listed marine mammals. The use of TALDS is not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of TALDS associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of TALDS during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

BQM-74E

The BQM-74E is a remote-controlled, subsonic, jet-powered aerial target that can be launched from the air or surface and recovered on land or at sea. It is powered by a jet engine, and thus contains oils, hydraulic fluid, batteries, and explosive cartridges. The hazardous materials of concern include propellant, petroleum products, metals, and batteries; however, the hazardous materials in aerial targets would be mostly consumed during training use.

Although BQM-74Es are recovered, pieces of expended BQM-74Es (if any) are a potential ingestion hazard for marine mammals after they sink to the bottom. However, the probability of ingestion is extremely low based on the low number of BQM-74Es expended per year (2) versus the large operational area of the TMAA. BQM-74E ingestion under the No Action Alternative may affect ESA-listed marine mammals. The use of BQM-74Es is not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of BQM-74Es associated with training activities would result in

effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of BQM-74Es during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

Sonobuoys

One sonobuoy type, a SSQ-036 BT (a temperature sensor with no active emissions), would be used under this alternative. Sonobuoys are deployed by either surface vessels or aircraft to monitor the environment, to passively detect sounds created by submarines and/or surface vessels, or to actively detect submerged or surface vessels by generating their own sonar signals. Sonobuoys are temporary devices that are activated once they contact ocean water. When their operating service life is attained, the sonobuoy shuts down and sinks to the ocean bottom to decompose. Under the No Action Alternative, up to 24 SSQ-036 BT sonobuoys would be deployed in the TMAA.

Aircraft-launched sonobuoys, flares, and markers deploy nylon parachutes of various sizes. At water impact, the parachute assembly is expended and sinks, as all of the material is negatively buoyant. Metallic components are heavy and will sink rapidly. Parachute and cord are lighter and sink more slowly but are weighted to insure they will do so. While these materials are sinking through in the water column, they represent a potential entanglement risk to passing marine mammals in the area. An estimated 24 sonobuoys, 12 flares, and 20 markers will be expended under the No Action Alternative (see Table 2-8). Given this number of sonobuoys, flares, and markers deployed, the large size of the TMAA, and the relatively low density of marine mammals in the area, the risk of a marine mammal encounter with a parachute assembly, and other military expended material is unlikely. Entanglement and the eventual drowning of a marine mammal in a parachute assembly would be unlikely, since such an event would require the parachute to land directly on an animal, or the animal would have to swim into it before it sinks. The expended material will accumulate on the ocean floor and will be covered by sediments over time, remaining on the ocean floor and reducing the potential for entanglement. If bottom currents are present, the canopy may billow and pose an entanglement threat to marine animals with bottom-feeding habits; however, the probability of a marine mammal encountering a submerged parachute assembly and the potential for accidental entanglement in the canopy or suspension lines is considered to be unlikely.

Expended sonobuoys are a potential ingestion hazard for marine mammals while they are floating, while they are descending to the seafloor, or after they sink to the bottom although this seems extremely unlikely. The probability of ingestion is also low based on the number of sonobuoys expended per year (24) compared to the size of the TMAA. It is not likely that sonobuoy ingestion would result in effects to the life functions of marine mammals in the TMAA. Sonobuoy ingestion under the No Action Alternative may affect ESA-listed marine mammals because it cannot be discounted. The use of sonobuoys is not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, harm to marine mammals resulting from use of passive sonobuoys during training exercises in nonterritorial seas (seaward of 12 nm [22 km]) would also be minimal.

Critical Habitats

There are no critical habitats in the TMAA. Provisions of the ESA require a determination of whether proposed federal actions may destroy or adversely modify critical habitat. Critical habitat designation is based on the presence and condition of certain physical and biological habitat factors called primary constituent elements (PCEs) that are considered essential for the conservation of the listed species (USFWS and NMFS 1998, ESA §3[5][A][i], 50 C.F.R. §424.12[b]). There are no designated Critical Habitat PCEs in the TMAA.

Therefore, in accordance with ESA consultation provisions to assess potential effects of Proposed Action to critical habitat, it is concluded that Navy activities will have no effect on any critical habitats.

3.8.7.9 Alternative 1

Under Alternative 1, the general level of some activities in the TMAA would increase relative to those under the No Action Alternative. In addition, training activities associated with force structure changes would be implemented for the EA-18G Growler, SSGN, P-8 MMA, DDG 1000, and UASs. Force structure changes associated with new weapons systems would include new sonobuoys. Force structure changes associated with new training instrumentation include the Portable Underwater Training Range (PUTR).

Marine mammals would have the potential to be affected by vessel movements, aircraft overflights, sonar, weapons firing/nonexplosive ordnance use, explosive ordnance, and expended materials under Alternative 1.

Vessel Movements

Under Alternative 1, the number of Navy vessels would increase by four (three surface vessels and one submarine) for a total of eight Navy vessels, a 50 percent increase over the No Action Alternative. This increase would include both training and transit activities for Alternative 1. Contracted support vessels would remain at 19. The total increase in vessel activity equates to a 17 percent increase over the No Action Alternative. These changes would result in increased potential for short-term behavioral reactions to naval vessels. Potential for collision would increase slightly compared to the No Action Alternative; however, Navy mitigation measures would reduce the probability and collisions would remain unlikely. Vessel movements are not expected to result in effects to the life functions of marine mammals. Vessel movements under Alternative 1 may affect ESA-listed marine mammals. Vessel movements are not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, vessel movements would cause minimal harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Aircraft Overflights

Alternative 1 would have no increase in the 300 fixed-wing aircraft sorties under the No Action, but would add six training events as described in Table 2-7. Alternative 1 would also add 26 helicopter events associated with ASW, Deck Launch Qualifications, and Air-to-Surface training. Peak noise levels generated by the MH-60R/S helicopters would be similar to the noise levels generated with the No Action Alternative.

The additional overflights may result in increased instances of behavioral disturbance due to sound, shadow-effects, and/or, in the case of helicopters, water column disturbance. As with the No Action Alternative, the responses would be limited to short-term behavioral or physiological reactions. It is not likely that exposures to aircraft overflights associated with training activities would result in effects to the life functions of marine mammals in the TMAA. Aircraft overflights under Alternative 1 may affect ESA-listed marine mammals. Aircraft overflights of the TMAA are not expected to result in Level A or Level B harassment as defined by the MMPA. Furthermore, aircraft overflights would not cause notable harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]) in accordance with EO 12114. All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m) and would have no effect on marine mammals.

Non-explosive Practice Ordnance

The number of non-explosive practice ordnance events by type of projectile occurring for Alternative 1 is presented in Table 2-8. Non-explosive practice ordnance includes naval gunshells (20mm, 25mm, 57mm, 76mm, and 5-in projectiles) and small arms rounds (7.62mm and .50-caliber projectiles). Under Alternative 1, there would be about 13,132 naval gunshells and about 5,700 small arms projectiles

expended into the ocean. Compared to the No Action Alternative, this equates to an increase of about 24 percent and 14 percent respectively, in naval gunshells and small arms projectiles.

These changes would result in increased potential exposure of marine mammals to ordnance strikes; however, Navy standard operating procedures and mitigation measures would reduce the probability of strikes by modifying activities when marine mammals are known to be in the area. It is not likely that use of non-explosive ordnance associated with training activities would result in effects to the life functions of marine mammals in the TMAA. There should be no effect from use of non-explosive practice ordnance, but it may affect ESA-listed marine mammals under Alternative 1. Non-explosive ordnance use is not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, non-explosive practice ordnance would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Explosive Ordnance (At-Sea Explosions)

The number of explosive events by type of ordnance occurring for Alternative 1 is presented in Table 2-8. In addition to 42 5-inch and 14 76mm live rounds, a total of 72 high-explosive bombs (MK-82, MK-83 and MK-84 types) will be detonated in the water annually. Detonation of bombs represents an increase of 40 percent for live gunfire and 150 percent for bomb detonations compared to the No Action Alternative. These changes would represent an increased potential for marine mammals exposure to detonation concussion effects and behavioral disturbance.

SSQ-110 Sonobuoys (IEER; At-Sea Explosions)

Also introduced under Alternative 1 would be the use of the Extended Echo Ranging (EER) system using approximately 40 SSQ-110 active and 40 passive SSQ-101 Air Deployable Active Receiver (ADAR) (in pairs). These are used by Maritime Patrol Aircraft (MPA) (P-3 or P-8 aircraft) when conducting "large area" searches for submarines. The SSQ-110's active component contains a small explosive charge that generates acoustic energy when detonated (Note: for this reason effects from use of SSQ-110 are covered under this section dealing with at-sea explosions). If an underwater target is within range, the echo is received by the passive ADAR sonobuoy and transmitted to the aircraft. The sonobuoy pairs are dropped from a MPA in a predetermined pattern with a few buoys covering a very large area. Upon command from the aircraft, the ribbon charge is released and subsequently detonated, generating a "ping." There is only one detonation in the pattern of buoys at a time. Under Alternative 1, approximately 40 of the SSQ-110 would be used for training in the TMAA.

Proposed for replacement of the SSQ-110 (EER/IEER) is the SSQ-125 Acoustic Extended Echo Ranging (AEER) system, which is similar to the existing EER/IEER system in that it will be used for the same purpose and will use the same ADAR sonobuoy as the acoustic receiver. However, instead of using an explosive SSQ-110 as an impulsive source for the active acoustic wave, the AEER system will use a battery powered (electronic) source for the SSQ 125 sonobuoy. The output and operational parameters for the SSQ-125 sonobuoy (source levels, frequency, wave forms, etc.) are classified. The SSQ-125 sonobuoy is intended to replace function of the SSQ-110 buoy. Acoustic impact analysis for the SSQ-125 in this document was not undertaken given the uncertainty of the deployment year.

To get a sense of the potential differences between these buoy systems it is necessary to understand that not every SSQ-110 buoy deployed is command activated (via radio) to explosively generate an acoustic wave; however, those that are not command activated do explode when commanded to scuttled or via an automatic timing device. Given that the SSQ-125 has an electronically generated acoustic wave and may be scuttled without ever being activated (unlike the SSQ-110), the potential to affect marine mammals is less for the same number of SSQ-110 buoys. The analysis presented for SSQ-110 in this EIS/OEIS

models every buoy as having detonated and therefore provides an overestimate of potential effects to marine mammals from the use of replacement SSQ-125 if that should occur in the future.

The modeled explosive exposure harassment numbers by species and harassment exposures for rare species or those few in number are presented in Table 3.8-10. The table quantifies MMPA Level B harassments from behavioral disturbance and MMPA Level A harassments from potential injury to marine mammals from Alternative 1.

Table 3.8-10: Alternative 1 Annual At-Sea Explosion Exposures Summary

Species	MMPA Level B Harassment		MMPA Level A Harassment	Mortality
	Sub-TTS 177 dB re 1µPa^2-s	TTS 182 dB / 23 psi	50 percent TM Rupture 205 dB Slight Lung Injury or 23 psi-ms	Onset massive Lung Injury or Mortality 31 psi-ms
ESA Species				
Blue whale	1*	0	0	0
Fin whale	7	2	0	0
Humpback whale	2*	0	0	0
North Pacific Right whale	1*	0	0	0
Sei whale	4*	0	0	0
Sperm whale	1*	0	0	0
Steller sea lion	1	1	0	0
Non-ESA Listed Species				
Baird's beaked whale	11*	0	0	0
Cuvier's beaked whale	1	0	0	0
Dall's porpoise	42	19	1	0
Gray whale	3*	0	0	0
Harbor Porpoise	2*	0	0	0
Killer whale	2	1	0	0
Minke whale	2*	0	0	0
Pacific white-sided dolphin	6	3	0	0
Stejnger's beaked whale	1	0	0	0
California sea lion	1*	0	0	0
Harbor Seal	1*	0	0	0
Northern elephant seal	2	1	0	0
Northern fur seal	12	7	0	0
Total	**103**	**34**	**1**	**0**

Notes: dB = decibel, dB re 1µPa^2-s = decibels referenced to 1 micropascal squared per second, ESA = Endangered Species Act, psi = pound per square inch, psi-ms =pounds per square inch per millisecond, PTS = Permanent Threshold Shift, TM = Tympanic membrane, TTS = Temporary Threshold Shift; * = Accounting for rare animals.

At-Sea Explosions Summary

For at-sea explosions under Alternative 1, quantification from modeling and accounting for rare species indicates 103 MMPA Level B harassments from sub-TTS for MSE. The modeling indicates 34 MMPA

Level B harassments from TTS. Under Alternative 1 for at-sea explosions, quantification from modeling and accounting for rare species, indicates a total of 137 MMPA Level B harassments annually. These exposure modeling results are estimates of marine mammal at-sea explosion sound exposures without consideration of standard operating procedures and mitigation procedures. The implementation of the mitigation presented in Section 5.2.1 will reduce the potential occurrence for some of these modeled marine mammal exposures and harassments as a result of area clearance procedures for harassments (NMFS 2008a). Modeling for at-sea explosions under Alternative 1 also indicates potential for one MMPA Level A harassment from slight injury and no annual exposures that could cause severe injury or mortality. This slight injury exposure should not occur given it is predicted for Dall's porpoise, which should be readily detectable given the species general large group size and characteristic porpoising behavior.

Behavioral effects modeling, accounting for rare species for which modeling was not possible, and for which modeling provided an estimate of zero exposures, indicates at-sea explosion exposures under Alternative 1 may affect ESA listed blue, fin, humpback, North Pacific right, sei, and sperm whales, and Steller sea lions. It is not likely that use of ordnance or SSQ-110 sonobuoys associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, at-sea explosions would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Active Sonar for ASW Training

Sonar use for ASW did not occur under the No Action alternative. Under Alternative 1, mid- and high frequency active sonar use would be undertaken including SQS-53 (289 hours) and SQS-56 (26 hours) surface ship sonars, the BQQ-10 (24 hours) and BQS-15 (12 Hours) submarine sonars, plus SSQ-62 sonobuoys (133 ea; Note: use of SSQ-110 [EER] sonobuoys are covered under the section dealing with at-sea explosions), and 96 dips of helicopter dipping sonar that would be deployed (Table 3.8-11).

Table 3.8-11: Annual Sonar Hours and Sources for Alternative 1

	SQS 53 Sonar [a]	SQS-56 Sonar [a]	BQQ-10 Sonar [a]	BQS-15 Sonar [a]	SSQ-62 DICASS Sonobuoy[b]	AQS 22 Dipping Sonar[c]
Alternative 1	289	26	24	12	133	96

Notes: a = Number reflects hours of operations not total transmission time, representative for all variants of system. b = Number is counted by buoy, c = Number is counted as individual use "dips" of the system

Non-Sonar Acoustic Sources Used During Training

In addition to the use of mid- and high frequency sonar, additional non-sonar acoustic sources used during training under the proposed alternatives. For Alternative 1, this would include components of the Portable Undersea Tracking Range, including MK-84 Range Tracking Pingers (40 ea) and Transponders (40 ea), and other sources consisting of MK-39 EMATT targets (6 ea) and SUS MK-84 signaling devices (12 ea). Use of these sources did not occur under the No Action Alternative. Each of these acoustic sources is described in the following paragraphs with the total proposed use under Alternative 1 provided in Table 3.8-12.

Table 3.8-12: Annual Non-Sonar Acoustic Sources for Alternatives 1

	MK-84 PUTR Tracking Pingers [a]	PUTR Transponders [a]	MK-39 EMATT targets[b]	SUS MK-84 signaling devices[b]
Alternative 1	40	40	6	12

Notes: a = This number reflects hours of operation for the PUTR system under average conditions and is not total transmission time of the components. b = Number is counted by device.

Portable Undersea Tracking Range (PUTR) – MK-84 Pingers and Transponders

The use of Portable Undersea Tracking Range (PUTR) is proposed to support ASW training under the proposed alternatives. The PUTR is a self-contained, portable, undersea tracking system that employs modern technologies to support coordinated undersea warfare training for Forward Deployed Naval Forces. PUTR will be available in two variants to support both shallow and deep water remote activities in keeping with Navy requirements to exercise and evaluate weapons systems and crews in the environments that replicate potential combat areas. The system will be capable of tracking submarines, surface ships, weapons, targets, and Unmanned Underwater Vehicles (UUVs) and distribute the data to a data processing and display system, either aboard ship, or at a shore site. No specific area for use of a PUTR system has been identified in the TMAA.

The PUTR functions by the use of MK-84 tracking pingers affixed to vessels and targets with anchored transponders detecting the pinger signals and relaying those signals to a hydrophone on a buoy or stationary vessel serving as a hub for relay to range controllers via radio. The pingers in the TMAA were modeled as using having a 12.9 kHz, 15 millisecond signal at 194 dB re 1µPa every two seconds. The transponders were modeled as in 1,800 m depth and operating at 8.8 kHz with each pinger report assumed to be 15 milliseconds duration. The transponder spacing is designed so that four transponders will hear each pinger signal. Therefore, for every pinger signal there will be four transducer reports – one ping every two seconds is representative. However, not every ping will be heard. The design of the PUTR assumes 63% (5 in 8) will be received by the transducer. It is therefore assumed that of the 30 pinger signals per minute (per pinger), an average of 19 (63%) pinger signals will be received by four transponders and therefore generate 76 pinger signal reports from transponders to the range relay hub.

MK-39 Expendable Mobile Anti-Submarine Warfare Training Target (EMATT)

An Expendable Mobile Anti-Submarine Warfare Training Target (EMATT) is a device approximately two feet in length and three inches in diameter looking like a small torpedo. EMATT can be launched by hand from a surface vessel or deployed from a submarine or aircraft. EMATTs are programmed to move through the water and provide acoustic broadband noise and magnetic signals that mimic a submarine. For modeling, a speed of five knots and a depth of 100 meters was modeled as representative with the acoustic output a continuous tone 900 Hz at 130 db for four hours.

SUS MK-84 Signaling Devices

The SUS MK-84 signaling device is a small bomb shaped device that can be deployed from aircraft and ships and is used to communicate with submarines. Two seconds after the SUS MK-84 enters the water, it begins emitting a coded signal for approximately 70 seconds. Depending on the mode selected, the tone alternates between two frequencies (3.3 kHz and 3.5 kHz) in a one to three second interval, or operates at the single 3.5 kHz frequency. For modeling, a total of 35 pings at 3.4 kHz and a source level of 160 dB/uPa for two seconds each at one second intervals at 50 meters depth was modeled to be representative of the device.

Quantification from acoustic impact modeling for active sonar and other non-sonar acoustic sources use under Alternative 1 and possible exposures for rare animals indicates 215,053 MMPA Level B harassments from non-TTS (Table 3.8-13). The modeling also indicates 466 MMPA Level B harassments from TTS. Without consideration of the reduction expected from implementation of mitigation measures, the total MMPA Level B harassments for active sonar use is 215,519 under Alternative 1.

Without consideration of the reduction expected from implementation of mitigation measures, modeling indicates potential for one MMPA Level A harassment under Alternative 1 for acoustic sources. This one exposure should not occur given it is predicted for Dall's porpoise, which should be readily detectable given their general large group size and characteristic porpoising behavior. The implementation of the

mitigation procedures presented in Section 5.1.7 will also reduce the potential occurrence for some of the modeled MMPA Level B marine mammal exposures and harassments (NMFS 2008a).

Table 3.8-13: Alternative 1 Annual Sonar and Non Sonar Acoustic Exposures Summary

Species	MMPA Level B Harassment		MMPA Level A Harassment
	Non-TTS	TTS	PTS
ESA Species			
Blue whale	1*	0	0
Fin whale	5,501	11	0
Humpback whale	694	3	0
North Pacific Right whale	1*	0	0
Sei whale	4*	0	0
Sperm whale	164	0	0
Steller sea lion	5,553	1	0
Non-ESA Listed Species			
Baird's beaked whale	243	1	0
Cuvier's beaked whale	1,151	3	0
Dall's porpoise	102,750	384	1
Gray whale	192	1	0
Harbor Porpoise	5,438	0	0
Killer whale	5,301	20	0
Minke whale	341	1	0
Pacific white-sided dolphin	8,456	30	0
Stejneger's beaked whale	1,151	3	0
California sea lion	1*	0	0
Harbor seal	1*	0	0
Northern elephant seal	1,031	0	0
Northern fur seal	77,079	8	0
Total	**215,053**	**466**	**1**

TTS and PTS Thresholds: Cetaceans TTS = 195 dB re 1 μPa^2-s; PTS = 215 dB, re 1 μPa^2-s; Northern elephant seal TTS = 204 re 1 μPa^2-s, PTS = 224 re 1 μPa^2-s; Otariids TTS = 206 re 1 μPa^2-s, PTS = 226 re 1 μPa^2-s; * = Accounting for rare animals.

Notes: ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act, PTS = Permanent Threshold Shift, TTS = Temporary Threshold Shift

Behavioral effects modeling indicates sonar use under Alternative 1 may affect ESA listed blue, fin, humpback, North Pacific right, sei, and sperm whales, and Steller sea lions. It is not likely that use of acoustic sources associated with training activities would result in effects to the life functions of marine mammals in the TMAA based on previous NMFS Biological Opinions for the same actions in other locations (NMFS 2008a, 2009b; NOAA 2009). In accordance with EO 12114, non-explosive practice ordnance would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Expended Materials

Under the Alternative 1, 20,223 expendable items may be used resulting in a 26 percent increase over the No Action. The types and quantities of materials expended and information regarding fate and transport of these materials within the marine environment are discussed in Section 3.2 (Expended Materials), and Section 3.3 (Water Resources). The analyses in these sections determined that most expended materials rapidly sink to the seafloor where they become encrusted by natural processes or are incorporated into the seafloor, with no substantial accumulations in any particular area and no significant negative effects to water quality or marine benthic communities. Given that materials expended during training do not remain at the surface and are generally used in areas where the water depth is beyond that of foraging marine mammals, it is unlikely expended materials would later be encountered by any marine mammal.

Portable Undersea Tracking Range (PUTR) Materials

Upon deployment of the PUTR, clump weights are used to anchor up to 7 transponders in place. As a result of these anchor weights, there would be direct localized impact to bottom habitat; however, this should have no impact on marine mammals. Sediments stirred up by the clump weight anchors should only result in a temporary and localized turbidity. Upon completion of the exercise, the transponders are recovered, which eliminates any potential impacts associated with hazardous materials such as batteries and electronic components associated with the PUTR system. The clump weights are not recovered, and since they are composed of inert material (such as iron, chain, or concrete), they are not a potential source of contaminants. The expending of PUTR anchor weights under Alternative 1 should have no effect on ESA-listed blue whales, fin whales, humpback whales, North Pacific right whales, sei whales, Steller sea lions or other marine mammals in the TMAA. Expending PUTR anchor weights would not be expected to result in MMPA Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, expending of PUTR anchor weights would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Ordnance-Related Materials

The number of ordnance related materials used in the TMAA would increase under Alternative 1 (Table 2-8) to 19,101, increasing by approximately 21 percent from current conditions.

Ingestion of ordnance under Alternative 1 may affect sperm whales. Ordnance-related materials under Alternative 1 should have no effect on ESA listed blue whales, fin whales, humpback whales, North Pacific right whales, sei whales, Steller sea lions or other marine mammals in the TMAA based on the feeding habits of these species. Ordnance-related materials would not be expected to result in MMPA Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, ordnance-related materials would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Target Related Materials

The number of targets and target-related material used in the TMAA would increase to 125 or by about 95 percent over the No Action. There would be the introduction of Expendable Mobile Anti-Submarine Warfare Training Target (EMATT) under Alternative 1. As discussed above for the No Action Alternative, species that feed on or near the bottom (which are the sperm whales and beaked whales) may encounter an expended target while feeding; however, the size of the target would generally prohibit any listed species from ingesting it. Therefore, the use of targets under Alternative 1 likely would have no effect, but may affect ESA listed marine mammals. Targets would not be expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with E.O. 12114, targets would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Chaff

Under Alternative 1, there would be no change in the quantity of chaff used (540 lbs/245 kg) for the No Action. As detailed in Section 3.2.1.1, chaff consists of aluminum-coated fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor.

As first presented in DoN (2009), the dispersion characteristics of chaff make it likely that marine mammals would occasionally come in direct contact with chaff fibers while at the water's surface and while submerged, but such contact would be inconsequential. Chaff is similar in form to fine human hair with the fibers being flexible and soft. Evaluation of the potential for chaff to be inhaled by humans, livestock, and animals found that the fibers are too large to be inhaled into the lung (Arfsten et al. 2002, Hullar et al. 1999, USAF 1997). Although these reviews did not specifically consider the respiratory system of large whales, any effects of chaff inhalation on marine mammals are considered insignificant given the dispersal of chaff fibers resulting in very low concentration in the air.

While no studies have been conducted to evaluate the effects of chaff ingestion on marine mammals, the effects are expected to be insignificant and discountable based the low concentrations when dispersed, the small size of chaff fibers, available data on the toxicity of chaff components (silicon dioxide and aluminum), and evidence indicating the lack of significant accumulation of aluminum in sediments after prolonged training (DoN 2009). Silicon and aluminum are two of the most abundant elements in the earth's crust. Marine mammals, such as gray whales that forage on the bottom, routinely ingest sediment containing these elements. The aluminum concentrations in brain tissue of gray whales are within the range for terrestrial mammals that may receive high concentrations of aluminum in their diets, suggesting a broad range in tolerance to aluminum in mammals (Varanasi et al. 1993, Tilbury 2002, DoN 2009). Chaff cartridge plastic end-caps and pistons would also be expended into the marine environment, where they would sink and could potentially be ingested by marine mammals. Based on the low concentration of these components in the TMAA, it is very unlikely a marine mammal would encounter a plastic end-cap or piston from the chaff cartridge. Even in the very unlikely event one of these components was encountered and then consumed by a marine mammal, the small size of chaff end-caps and pistons (1.3 inch [33 mm] diameter and 0.13 inch [3.3 mm] thick) would suggest it would likely pass through the digestive tract and be voided without causing harm.

Under ESA, chaff use under the Alternative 1 may affect blue, fin, humpback, North Pacific right, sei, and sperm whales. Use of chaff is not expected to result in Level A or Level B harassment as defined by the MMPA and would not cause significant harm to marine mammals in non-territorial waters in accordance with EO 12114.

Marine Markers

The number of marine markers used in the TMAA would increase under Alternative 1 to 60 per year. The probability of a marine mammal ingesting an expended marine marker would be essentially the same as under the No Action Alternative (using 20 markers). Marine marker ingestion under Alternative 1 may affect ESA-listed marine mammals. The use of marine markers is not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of marine markers during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

TALDS

The number of TALDS used in the TMAA would increase under Alternative 1 to 12 per year. The probability of a marine mammal ingesting pieces of an expended TALD would be essentially the same as

under the No Action Alternative (using 8 TALDS). TALD ingestion under Alternative 1 may affect ESA-listed marine mammals. The use of TALDS is not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of TALDS during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

BQM-74Es

The number of BQM-74Es used in the TMAA under Alternative 1 would remain at 2 per year. The probability of a marine mammal ingesting pieces of an expended BQM-74E would be the same as under the No Action Alternative. BQM-74E ingestion under Alternative 1 may affect ESA-listed marine mammals. The use of BQM-74Es is not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of BQM-74Es during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

EMATT

There was no use of EMATTs under the No Action Alternative. The use of up to 6 EMATTs could occur under Alternative 1 in support of ASW Training. An EMATT is a small device (approximately 2 ft in length and 3 inches in diameter) shaped like a torpedo that can be launched by hand from a surface vessel or deployed from a submarine or aircraft. EMATTs are programmed to move through the water and provide acoustic and other sensor that mimic a submarine. At the end of its use, an EMATT will sink to the floor of the ocean. Expended EMATTs are unlikely to result in any physical impacts to the sea floor. Expended EMATTs would sink into a soft bottom or would lie on a hard bottom, where they may provide a substrate for benthic colonization and may be covered eventually by shifting sediments.

Use of EMATT under Alternative 1 may affect ESA-listed marine mammals. The use of EMATT is not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of EMATT associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from the use of EMATT during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

DICASS, SUS MK-84, and Passive Sonobuoys

There was no use of active sonobuoys under the No Action Alternative, however, the number of SSQ-36 expendable Bathythermograph (BT) sonobuoys would increase from 24 under current conditions to 60 under Alternative 1. The use of passive and active sonobuoys for ASW is proposed under Alternative 1. Introduced for the first time under Alternative 1, approximately 133 active (SSQ-62 DICASS) acoustic sonobuoys would be deployed in the TMAA annually and approximately 500 passive SSQ-53 Directional Frequency and Ranging (DIFAR) sonobuoys would be used in conjunction with the DICASS sonobuoys. Approximately 60 SSQ-77 Very Long Range Acoustic Detection (VLAD) passive sonobuoys would also be used under Alternative 1. Approximately 12 SUS MK-84 signaling devices would be used under Alternative 1.

Entanglement impacts to marine mammals from sonobuoys and other military expended material are unlikely. The assemblies would sink and the density of such military expended materials in the TMAA would be a very low concentration. Expended sonobuoys are a potential ingestion hazard for marine mammals while they are floating, while they are descending to the seafloor, or after they sink to the bottom. However, the probability of ingestion is extremely low based on the low number of sonobuoys expended per year (745) across the TMAA. Sonobuoy ingestion under Alternative 1 may affect ESA-listed marine mammals. The use of passive sonobuoys is not expected to result in Level A or Level B

harassment as defined by the MMPA. Effects of active sonobuoys are addressed as part of the sonar analysis. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of passive sonobuoys during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

Critical Habitats

There is no critical habitat located or PCEs in the TMAA. Therefore, in accordance with ESA consultation provisions to assess potential effects of proposed actions to critical habitat, it is concluded that Navy activities of Alternative 1 will have no effect on any critical habitat.

3.8.7.10 Alternative 2

Implementation of Alternative 2 would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional separate summertime CSG exercise lasting up to 21 days within the ATA.
- Conduct a SINKEX in each summertime exercise (a maximum of two) in the TMAA.

Marine mammals would have the potential to be affected by vessel movements, aircraft overflights, sonar, weapons firing/nonexplosive ordnance use, explosive ordnance, and expended materials under Alternative 2.

Vessel Movements

Under Alternative 2, the number of vessels would remain the same as under Alternative 1. However, The Navy has proposed providing the flexibility to conduct (as required) a second summer exercise within the TMAA between 2010 and 2015. Within the maximum two summer exercises, the length of the exercise, the number of vessels, and the allotted at-sea time within the TMAA during an exercise will be variable between years. These variations cannot be predicted given unknowns including the availability of participants for the annual exercise(s), which is a direct result of factors such as Navy responses to real-world events (e.g., tactical deployments, disaster relief, humanitarian assistance, etc.), planned and unplanned deployments, vessel availability due to funding and maintenance cycles, and logistic concerns with conducting an exercise in the GOA. The Navy predicts, however, there will be no increase required in excess of two annual summer exercises as described for Alternative 2 over the course of the 2010 and 2015 timeframe such that it is unlikely increases in steaming days would occur during this time period.

The additional vessel movements under Alternative 2 would result in a small increased potential for short-term behavioral reactions to naval vessels. Potential for collision would increase slightly compared to the No Action Alternative during each of two possible summertime exercises; however, Navy mitigation measures would reduce the probability and vessel collisions with whales remains unlikely. Vessel movements under Alternative 2 may affect ESA-listed marine mammals. Vessel movements are not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, vessel movements would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]) in accordance with EO 12114.

Aircraft Overflights

Alternative 2 would include 600 fixed-wing aircraft sorties (a 100 percent increase over the No Action). There would be 118 events involving helicopters in the TMAA compared to 32 under the No Action Alternative (existing conditions). The number of aircraft sorties and events using helicopter are double for

Alternative 2 as compared to Alternative 1 and would occur in the same locations. As a result, the potential for marine mammals to be exposed to overflights would increase compared to baseline conditions. Some training would involve supersonic flight, resulting in sonic booms, but such airspeeds are infrequent and occur above 30,000 ft (9,144 m) and at least 30 nm (56 km) offshore, further reducing their potential for noise impacts. Peak noise levels generated by individual SH-60 helicopters would be similar to the noise levels generated with the No Action Alternative.

The additional overflights may result in increased instances of behavioral disturbance due to sound, shadow-effects, and/or, in the case of helicopters, water column disturbance. Similar to the No Action Alternative, the responses would be limited to short-term behavioral or physiological reactions. It is not likely that exposures to aircraft overflights associated with training activities would result in effects to the life functions of marine mammals in the TMAA. Aircraft overflights under Alternative 2 may affect ESA-listed marine mammals. Aircraft overflights are not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO12114, aircraft overflights would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]). All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m) and would have no effect on marine mammals.

Non-explosive Practice Ordnance

The total number of non-explosive practice projectiles would increase with Alternative 2. The number of non-explosive practice ordnance events by type of projectile occurring for Alternative 2 is presented in Table 2-7. Non-explosive practice ordnance includes naval gunshells (20mm, 25mm, 57mm, 76mm, and 5-in projectiles) and small arms rounds (7.62mm and .50-caliber projectiles). Under Alternative 2, there would be about 27,176 naval gunshells and about 11,400 small arms projectiles expended into the ocean. Compared to the No Action Alternative, there would be increases of about 157 percent and 128 percent respectively, in naval gunshells and small arms projectiles.

These changes would result in increased potential exposure of marine mammals to non explosive practice ordnance strikes; however, Navy standard operating procedures and mitigation measures would reduce the probability of strikes by modifying training activities when marine mammals are known to be in the area. It is not likely that use of non-explosive ordnance associated with training activities would result in effects to the life functions of marine mammals in the TMAA. There should be no effect from use of non-explosive practice ordnance, but it may affect ESA-listed marine mammals under Alternative 2. Non-explosive ordnance use is not expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, non-explosive practice ordnance would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Explosive Ordnance (At-Sea Explosions)

The number of high explosive events by type of ordnance occurring for Alternative 2 is presented in Table 2-8. In addition to 84 5-inch and 28 76mm live rounds, a total of 144 high-explosive bombs (MK-82, MK-83 and MK-84 types), and two MK-48 torpedoes will be detonated in the water annually. Much of this increase in at-sea explosions is due to the introduction of two proposed SINKEX events per year. While recognizing a SINKEX event concentrates explosives at a single location that has been observed to be free of marine mammals and sea turtles, this represents a 580 percent increase in live gunfire and a 206 percent increase for bomb detonations in the water as compared to the No Action Alternative. These changes would represent an increased potential for marine mammals exposure to detonation concussion effects from ordnance use and behavioral disturbance. In addition, under Alternative 2 approximately 80 of the SSQ-110 sonobuoys, which have an explosive as a sound source, would be used for training in the TMAA.

SINKEX

In addition to the events noted above, under Alternative 2 the potential to conduct a SINKEX training event during each of the two possible summer exercise periods is also proposed. During a SINKEX, a decommissioned vessel is towed to a deep-water location and sunk using a variety of ordnance containing high explosives that may include missiles, bombs, and gunfire. For each SINKEX, there may be up to 17 missiles, 10 non-inert bombs, and 400 explosive rounds of 5-inch gunfire used during the event. For modeling purposes it was assumed that all missiles except a portion of the Maverick missiles fired would hit the target vessel. Approximately one third of the non-guided munitions used (one Maverick missile, three bombs, and 120 of the 5-inch rounds) were modeled as missing the target vessel and exploding in the water (for details, see Appendix D). SINKEX may also include the use of one MK-48 torpedo, which can be used at the end of SINKEX if the target is still afloat.

Aspects of the SINKEX event that have potential effects on marine mammals (e.g., vessel movement, aircraft overflights, gunfire firing noise, munitions constituents) have been analyzed separately in previous sections. If a marine mammal remained in the immediate vicinity of the SINKEX, ordnance missed the target vessel, and then impacts the water at or near a marine mammal, behavioral disturbance, injury, or mortality could occur. SINKEX under Alternative 2 is, however, not likely to result in injury or mortality given the assumption that marine mammals will not remain in the vicinity of the activities surrounding a SINKEX event and that mitigation involving area clearance requirements during the lengthy set-up to safely conduct a SINKEX (see Section 5.2.1.2) will reduce the likelihood that animals would be in the vicinity during the event. The modeled explosive exposure harassment numbers by species are presented in Table 3.8-14. The table quantifies MMPA Level B harassment from behavioral disturbance and MMPA Level A harassment from potential injury to marine mammals.

Without consideration of target area clearance procedures as standard mitigation, quantification from behavioral effects modeling, accounting for rare species indicates at-sea explosion exposures under Alternative 2 may affect ESA listed blue, fin, humpback, North Pacific right, sei, and sperm whales, and Steller sea lions. For large whales, exposures in vicinity to a source are unlikely to occur given the sightability of species such as blue, fin, humpback, North Pacific right, sei, and sperm whales.

For at-sea explosions under Alternative 2, quantification from modeling and accounting for rare species indicates 170 MMPA Level B harassments from sub-TTS for MSE. The modeling indicates 70 MMPA Level B harassments from TTS. Under Alternative 2 for at-sea explosions, quantification from modeling and accounting for rare species, indicates a total of 240 MMPA Level B harassments annually.

Quantification from modeling also indicates potential for four MMPA Level A harassments from slight injury and one estimated exposure that could result in severe injury or mortality. The exposure modeling results are an estimate of marine mammal at-sea explosion sound exposures without consideration of standard mitigation procedures summed across all at-sea explosion events during the two proposed exercises per year. The implementation of the mitigation procedures presented in Section 5.1.7 will reduce the potential for marine mammal exposure and harassment through area clearance procedures (NMFS 2008a). The set up procedures and checks required for safety of event participants make it unlikely Dall's porpoise, Pacific white-sided dolphin, or Northern fur seal would remain in an area undetected during the set-up of the event or before explosive detonation occurred during the period the target area or SINKEX is under observation. In addition, the distances from an at-sea explosion at which these injuries would occur are relatively short and well within the buffer zones established as standard mitigation (see Section 5.1.7.2). Therefore, the four MMPA Level A harassments and the one severe injury/mortality are predicted by the modeling without consideration of standard mitigation should not occur. In accordance with EO 12114, a SINKEX training event during each of the two possible summer exercise periods would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Table 3.8-14: Alternative 2 Annual At-Sea Explosion Exposures Summary

Species	MMPA Level B Harassment		MMPA Level A Harassment	Mortality
	Sub-TTS 177dB dB re 1µPa^2-s (MSE)	TTS 182 dB / 23 psi	50 percent TM Rupture 205 dB Slight Lung Injury or 23 psi-ms	Onset massive Lung Injury or Mortality 31 psi-ms
ESA Species				
Blue whale	1*	0	0	0
Fin whale	13	5	0	0
Humpback whale	1	0	0	0
North Pacific Right whale	1*	0	0	0
Sei whale	4*	0	0	0
Sperm whale	1*	0	0	0
Steller sea lion	2	1	0	0
Non-ESA Listed Species				
Baird's beaked whale	1	0	0	0
Cuvier's beaked whale	3	1	0	0
Dall's porpoise	84	37	2	1
Gray whale	3*	0	0	0
Harbor Porpoise	2*	0	0	0
Killer whale	4	2	0	0
Minke whale	2*	0	0	0
Pacific white-sided dolphin	12	6	1	0
Stejnger's beaked whale	4	1	0	0
California sea lion	1*	0	0	0
Harbor Seal	1*	0	0	0
Northern elephant seal	4	1	0	0
Northern fur seal	26	16	1	0
Total	**170**	**70**	**4**	**1**

Notes: dB = decibel, dB re 1µPa2-s = decibels referenced to 1 micropascal squared per second, ESA = Endangered Species Act, MMPA = Marine Mammal Protection Act, MSE = Multiple Successive Explosions, psi = pound per square inch, psi-ms = pounds per square inch per millisecond, TM = Tympanic membrane, TTS = Temporary Threshold Shift; * = Accounting for rare animals.

Active Sonar and Other Non-Sonar Acoustic Sources for ASW Training

There was no sonar use in conjunction with ASW training under the No Action Alternative. Under Alternative 2, use of sonar and other non-sonar acoustic sources would double above that proposed in Alternative 1. This sonar and other non-sonar acoustic source use for ASW training is associated with the potential addition of another carrier strike group participating in the training during a second summer time-frame exercise. However, it is unlikely that effects to marine mammals from sonar and other non-sonar acoustic source use would be significant because of the mitigation measures employed by the Navy to exclude marine mammal presence in the vicinity of the sources.

Alternative 2 would include mid and high frequency sonar use, including 578 hours of SQS-53 and 52 hours of SQS-56 surface ship sonar (315 additional hours of usage over Alternative 1), the BQQ-10 (48 hours) and BQS-15 (24 Hours) submarine sonars (twice that of Alternative 1), 266 active SSQ-62 sonobuoys (increase of 133 sonobuoys compared to Alternative 1), and 192 dips (an increase of 96 compared to Alternative 1) of helicopter dipping sonar (see Table 3.8-15 and 3.8-16).

Table 3.8-15: Annual Sonar Hours and Sources for Alternative 2

	SQS 53 Sonar [a]	SQS-56 Sonar [a]	BQQ-10 Sonar [a]	BQS-15 Sonar [a]	SSQ-62 DICASS Sonobuoy[b]	AQS 22 Dipping Sonar[c]
Alternative 2	578	52	48	24	266	192

Notes: a = Number reflects hours of operations not total transmission time, representative for all variants of system. b = Number is counted by buoy, c = Number is counted as individual use "dips" of the system

Non-Sonar Acoustic Sources Used During Training

In addition to the use of mid- and high frequency sonar, additional non-sonar acoustic sources used during training under the Alternative 2 would include components of the Portable Undersea Tracking Range including MK-84 Range Tracking Pingers (80 ea) and Transponders (80 ea), plus MK-39 EMATT targets (12 ea) and SUS MK-84 signaling devices (24 ea) as shown in Table 3.8-16. Use of these sources did not occur under the No Action Alternative and are double the numbers proposed for Alternative 1.

Table 3.8-16: Annual Non-Sonar Acoustic Sources for Alternative 2

	MK-84 Range Tracking Pinger[a]	PUTR Transponder[a]	MK-39 EMATT targets[b]	SUS MK-84 signaling devices[b]
Alternative 2	80	80	12	24

Notes: a = This number reflects hours of operation for the PUTR system under average conditions and is not total transmission time of the components. b = Number is counted by device.

Quantification from behavioral effects modeling, accounting for rare species for which modeling was not possible, and for which modeling provided an estimate of zero exposures, indicates sonar use under Alternative 2 may affect ESA listed blue, fin, humpback, North Pacific right, sei, and sperm whales, and Steller sea lions.

Quantification from behavioral effects modeling and accounting for rare species indicates 424,620 MMPA Level B harassments from non-TTS for Alternative 2 (Table 3.8-17). The modeling also indicates 931 MMPA Level B harassments from TTS. There is one predicted MMPA Level A harassment from PTS for Alternative 2. This one MMPA Level A harassment should not, however, occur given it is predicted for Dall's porpoise, which should be readily detectable given their general large group size and characteristic porpoising behavior. Without consideration of the reduction expected from implementation of mitigation measures, modeling and accounting for rare species estimates a total of 425,551 MMPA Level B harassments for active sonar and non-sonar acoustic sources for Alternative 2. The implementation of the mitigation and monitoring procedures presented in Section 5.1.7 will reduce the potential occurrence for some of these modeled marine mammal exposures and harassments (NMFS 2008a).

Under Alternative 2, sonar use may result in Level B harassment as defined by the MMPA. Sonar and non-sonar acoustic source use under Alternative 2 would not result in Level A harassment as defined by the MMPA. MMPA Level B harassments associated with Alternative 2 may affect the ESA listed blue whales, fin whales, humpback whales, North Pacific right whales, sei whales, sperm whales, and Steller sea lions.

It is not likely that use of sonar and other acoustic sources associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, use of sonar and other acoustic sources would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Table 3.8-17: Alternative 2 Annual Sonar and Non-Sonar Acoustic Exposures Summary

Species	MMPA Level B Harassment		MMPA Level A Harassment
	Non-TTS	TTS	PTS
ESA Species			
Blue whale	1*	0	0
Fin whale	10,998	21	0
Humpback whale	1,388	6	0
North Pacific Right whale	1*	0	0
Sei whale	4*	0	0
Sperm whale	327	1	0
Steller sea lion	11,104	1	0
Non-ESA Listed Species			
Baird's beaked whale	485	1	0
Cuvier's beaked whale	2,302	6	0
Dall's porpoise	205,485	768	1
Gray whale	384	1	0
Harbor Porpoise	5,438	0	0
Killer whale	10,602	41	0
Minke whale	677	2	0
Pacific white-sided dolphin	16,912	61	0
Stejneger's beaked whale	2,302	6	0
California sea lion	1*	0	0
Harbor seal	1*	0	0
Northern elephant seal	2,064	0	0
Northern fur seal	154,144	16	0
Total	**424,620**	**931**	**1**

TTS and PTS Thresholds: Cetaceans TTS = 195 dB re 1 μPa^2-s; PTS = 215 dB, re 1 μPa^2-s; Northern elephant seal TTS = 204 re 1 μPa^2-s, PTS = 224 re 1 μPa^2-s; Otariids TTS = 206 re 1 μPa^2-s, PTS = 226 re 1 μPa^2-s; * = Accounting for rare animals.

Notes: ESA = Endangered Species Act, MMPA = Marine Mammal Protection Act, PTS = Permanent Threshold Shift, TTS = Temporary Threshold Shift

Special Considerations for Beaked Whales

Neither NMFS nor the Navy anticipates that marine mammal strandings or mortality will result from the operation of mid-frequency sonar during Navy exercises within the TMAA. The history of Navy activities in the Gulf of Alaska and analysis in this document indicate that military readiness activities are not expected to realistically result in any sonar-induced Level A injury or mortalities to marine mammals.

However, evidence from five beaked whale strandings occurring at various locations around the world over approximately a decade, suggests that the exposure of beaked whales to mid-frequency sonar in the

presence of certain conditions (e.g., multiple units using tactical sonar, steep bathymetry, constricted channels, strong surface ducts, etc.) may result in strandings, potentially leading to mortality. Although these physical factors believed to contribute to the likelihood of beaked whale strandings are not present, in their aggregate, in the TMAA, scientific uncertainty exists regarding what other factors, or combination of factors, may contribute to beaked whale strandings. Recent data from the Southern California Range Complex (Falcone et al. 2009), where Navy ASW activities have been occurring year-round for decades, indicates Cuvier's beaked whales are resident at that ASW training location with no apparent effect from exposure to mid-frequency sonar.

To allow for scientific uncertainty regarding the strandings of beaked whales and the exact mechanisms of the physical effects, the Navy will request authorization for take, by mortality, of the beaked whale species present in the TMAA despite the decades long history of these same training operations with the same basic equipment having had no known effect on beaked whales at any Navy training ranges where mid-frequency sonar training routinely has occurred.

Accordingly and to account for this potential under the preferred alternative, the MMPA Letter of Authorization request will include an annual mortality take request for a total of three (3) beaked whales of the Ziphidae family, to include any combination of Baird's beaked whale, Cuvier's beaked whale, Stejneger's beaked whale, and Mesoplodon sp.

Expended Materials

The amount of expended materials would increase to 41,298 items or approximately 160 percent in the TMAA under Alternative 2 as compared to the No Action Alternative.

Portable Undersea Tracking Range (PUTR) Materials

Upon deployment of the PUTR, clump weights are used to anchor transponders in place. As a result of these anchor weights, there would be direct localized impact to bottom habitat; however, this should have no impact on marine mammals. Sediments stirred up by the clump weight anchors should only result in a temporary and localized turbidity. Upon completion of the exercise, the transponders are recovered, which eliminates any potential impacts associated with hazardous materials such as batteries and electronic components associated with the PUTR system. The clump weights are not recovered, and since they are composed of inert material, they are not a potential source of contaminants. The expending of PUTR anchor weights under Alternative 2 should have no effect on ESA listed blue whales, fin whales, humpback whales, North Pacific right whales, sei whales, Steller sea lions or other marine mammals in the TMAA. Expending PUTR anchor weights would not be expected to result in MMPA Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, expending of PUTR anchor weights would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Ordnance-Related Materials

The amount of ordnance-related materials would increase to 39,060 items or approximately 149 percent in the TMAA under Alternative 2 as compared to the No Action Alternative. Ingestion of ordnance under Alternative 2 may affect sperm whales. Ordnance-related materials under Alternative 2 should have no effect on the remaining ESA-listed species (blue, fin, humpback, North Pacific right, sei and sperm whales, and Steller sea lions) or other marine mammals in the TMAA based on the feeding habits of these species and the likely deep water areas where training using ordnance will occur. It is not likely that use of ordnance related material associated with training activities would result in effects to the life functions of marine mammals in the TMAA. Ordnance-related materials would not be expected to result in Level A or Level B harassment as defined by the MMPA. In accordance with EO 12114, ordnance related

materials would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Target-Related Materials

Under Alternative 2, the number of targets used in the TMAA would increase to 250, or approximately 290 percent over the No Action Alternative. As discussed above for the No Action Alternative, species that feed on or near the bottom (which are the sperm whales and beaked whales) could possibly encounter an expended target while feeding; however, the size of the target or pieces would generally prohibit any listed species from ingesting it. However, if target materials are fragmented into smaller pieces, there is a possibility to ingest fragments while feeding on the sea floor although the required co-occurrence of these unlikely events is considered discountable. Therefore, Alternative 2 may affect sperm whales under the ESA. Ingestion of target-related materials under Alternative 2 should not affect the other ESA listed marine mammals (blue, fin, humpback, North Pacific right, sei, and sperm whales, and Steller sea lions) given their feeding habits. Target materials would not be expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of targets associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO12114, targets would not cause significant harm to marine mammals in nonterritorial seas (seaward of 12 nm [22 km]).

Chaff

Under Alternative 2, the quantity of chaff used (1080 lbs/490 kg) would increase by 100 percent from the No Action. This increase is not considered significant given the size of the area involved. As detailed in Section 3.2.1.1, chaff consists of aluminum-coated fibers used as an electronic countermeasure designed to reflect radar waves and obscure aircraft, ships, and other equipment from radar tracking sources. Upon deployment, the chaff fibers are widely dispersed in the air and eventually land in the water and sink to the ocean floor.

As first presented in DoN (2009), the dispersion characteristics of chaff make it likely that marine mammals would occasionally come in direct contact with chaff fibers while at the water's surface and while submerged, but such contact would be inconsequential. Chaff is similar in form to fine human hair with the fibers being flexible and soft. Evaluation of the potential for chaff to be inhaled by humans, livestock, and animals found that the fibers are too large to be inhaled into the lung (Arfsten et al.2002, Hullar et al. 1999, USAF 1997). Although these reviews did not specifically consider the respiratory system of large whales, any effects of chaff inhalation on marine mammals are considered insignificant given the dispersal of chaff fibers resulting in very low concentration in the air.

While no studies have been conducted to evaluate the effects of chaff ingestion on marine mammals, the effects are expected to be insignificant and discountable based the low concentrations when dispersed, the small size of chaff fibers, available data on the toxicity of chaff components (silicon dioxide and aluminum), and evidence indicating the lack of significant accumulation of aluminum in sediments after prolonged training (DoN 2009). Silicon and aluminum are two of the most abundant elements in the earth's crust. Marine mammals, such as gray whales that forage on the bottom, routinely ingest sediment containing these elements. The aluminum concentrations in brain tissue of gray whales are within the range for terrestrial mammals that may receive high concentrations of aluminum in their diets, suggesting a broad range in tolerance to aluminum in mammals (Varanasi et al. 1993, Tilbury 2002, DoN 2009). Chaff cartridge plastic end-caps and pistons would also be expended into the marine environment, where they would sink and could potentially be ingested by marine mammals. Based on the low concentration of these components in the TMAA, it is very unlikely a marine mammal would encounter a plastic end-cap or piston from the chaff cartridge. Even in the very unlikely event one of these components was encountered and then consumed by a marine mammal, the small size of chaff end-caps and pistons (1.3

inch [33 mm] diameter and 0.13 inch [3.3 mm] thick) would suggest it would likely pass through the digestive tract and be voided without causing harm.

Under ESA, chaff use under the Alternative 2 may affect blue, fin, humpback, North Pacific right, sei, and sperm whales but these effects are insignificant and discountable. Use of chaff is not expected to result in Level A or Level B harassment as defined by the MMPA and would not cause significant harm to marine mammals in non-territorial waters in accordance with EO 12114.

SINKEX

As described previously in Section 2.6.1.1, a SINKEX event involves use of a decommissioned and environmentally remediated vessel as a target for training involving the use of bombs, missiles, gunfire, and torpedoes. Analysis of effects on marine mammals from at-sea explosions during a SINKEX was presented in the preceding sub-section. Analysis of the SINKEX vessel as expended material was presented in Section 3.2.2.6. In summary, however, each target vessel is made environmentally safe for sinking according to standards set by the U.S. Environmental Protection Agency (EPA). Requirements are that the SINKEX must occur greater than 50 nm (93 km) out to sea and in water depths greater than 6,000 ft (1,830 m) (40 C.F.R. § 229.2), which is beyond the known dive depth of marine mammals. The presence of a vessel hull on the bottom in excess of 6,000 ft (1,830 m) depth should have no effect on marine mammals.

Marine Markers

The number of marine markers used in the TMAA would increase 500 percent from the No Action under Alternative 2 to 120 per year. The probability of a marine mammal ingesting an expended marine marker would be extremely low based on the low concentration in the TMAA ($0.014/nm^2$). Marine marker ingestion under Alternative 2 may affect ESA-listed marine mammals. The use of marine markers is not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of marine markers associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of marine markers during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

TALDS

The number of TALDS used in the TMAA would increase 200 percent from the No Action under Alternative 2 to 24 per year. The probability of a marine mammal ingesting a piece of an expended TALD would be extremely low based on the size of the TMAA. TALD ingestion under Alternative 2 may affect ESA-listed marine mammals. The use of TALDS is not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of TALDS associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from the use of TALDS during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

BQM-74Es

The number of BQM-74Es used in the TMAA would increase 100 percent from the No Action under Alternative 2 to 4 per year. The probability of a marine mammal ingesting a piece of an expended BQM-74E would be extremely low based on the size of the TMAA. BQM-74E ingestion under Alternative 2 may affect ESA-listed marine mammals. The use of BQM-74Es is not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of BQM-74Es associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In

accordance with EO 12114, there would be no significant harm to marine mammals resulting from the use of BQM-74Es during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

EMATT

Use of EMATTs was not part of the No Action Alternative. The use of up to 12 EMATTs could occur under Alternative 2 in support of ASW Training. This is an increase of 100 percent over Alternative 1. Use of EMATT under Alternative 2 may affect ESA-listed marine mammals. The use of EMATT is not expected to result in Level A or Level B harassment as defined by the MMPA. It is not likely that use of EMATT associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from the use of EMATT during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

DICASS, SUS MK-84, and Passive Sonobuoys

The number of SSQ-36 BT sonobuoys could increase up to 120 under Alternative 2 (from 24 under the No Action; a 400 percent increase). There were no active sonobuoys used in conjunction with ASW training under the No Action Alternative. The number of passive and active sonobuoys would increase annually under Alternative 2 by approximately 200 percent more than Alternative 1. Approximately 1,507 sonobuoys would be deployed in the TMAA. Approximately 66 percent of the sonobuoys would be passive SSQ-53 DIFAR and an additional 8 percent would be passive SSQ-101 VLAD. About 17 percent of all sonobuoys would be active sonar emitters (SSQ-62 DICASS Active). Approximately 267 active (SSQ-62 DICASS) acoustic sonobuoys would be deployed in the TMAA annually and approximately 1,000 passive SSQ-53 Directional Frequency and Ranging (DIFAR) sonobuoys would be used in conjunction with the DICASS sonobuoys. Approximately 120 SSQ-77 Very Long Range Acoustic Detection (VLAD) passive sonobuoys would also be used under Alternative 2. Approximately 24 SUS MK-84 signaling devices would also be used under Alternative 2. Also under Alternative 2 would be the use of the EER system using approximately 80 SSQ-110 active and 80 passive SSQ-101 ADAR.

With regard to potential entanglement encounters between marine mammals and unrecovered sonobuoy and flare parachute assemblies expended during military activities, the entanglement effects would be potentially greater than those described for the No Action Alternative and Alternative 1 because of the greater number of sonobuoy and flare deployments (1,507 more sonobuoys than the No Action Alternative and 732 more sonobuoys than Alternative 1). With Alternative 2 unrecovered materials would sink; the amount remaining on or near the sea surface would be low, and the density of such military expended material would be double that resulting from Alternative 1 activities. Entanglement impacts to marine mammals from this and other military expended material are unlikely.

Expended sonobuoys are a potential ingestion hazard for marine mammals while they are floating, while they are descending to the seafloor, or after they sink to the bottom. However, the probability of ingestion is extremely low based on the number of sonobuoys expended (1,507) and the size of the TMAA. Sonobuoy ingestion under Alternative 2 may affect ESA-listed marine mammals. The use of passive sonobuoys is not expected to result in Level A or Level B harassment as defined by the MMPA. Acoustic effects of active sonobuoys and SUS MK-84 are addressed as part of the acoustic effects analysis. It is not likely that use of passive sonobuoys associated with training activities would result in effects to the life functions of marine mammals in the TMAA. In accordance with EO 12114, there would be no significant harm to marine mammals resulting from use of passive sonobuoys during training exercises in nonterritorial seas (seaward of 12 nm [22 km]).

Critical Habitats

There is no designated critical habitat or PCEs within the TMAA. Therefore, in accordance with ESA consultation provisions to assess potential effects of proposed actions to critical habitat, it is concluded that Navy activities of Alternative 2 will have no effect on any critical habitat.

3.8.8 Mitigation

The Navy has implemented a comprehensive suite of mitigation measures that will serve to reduce impacts to marine mammals that might result from Navy training in the TMAA. The mitigation measures applicable to this Proposed Action are described in Section 5.1.7. In order to make the findings necessary to issue a LOA under the MMPA, it may be necessary for NMFS to require additional mitigation or monitoring measures beyond those addressed in this EIS/OEIS. These measures could include measures considered, but eliminated in this EIS/OEIS, or as yet undeveloped measures. The public will have an opportunity, through the MMPA process, both to provide information to NMFS in the comment period following NMFS' Notice of Receipt of the application for an LOA, and to review any additional mitigation or monitoring measures that NMFS might propose in the comment period at the proposed rule stage. The final suite of measures developed as a result of the MMPA process would be identified and analyzed in the Final EIS/OEIS.

Effective training in the TMAA dictates that ship, submarine, and aircraft participants utilize their sensors and exercise weapons to their optimum capabilities as required by the mission. Section 5.1.7 presents a comprehensive list of mitigation measures that would be utilized for training activities analyzed in this EIS/OEIS in order to minimize potential for impacts on marine mammals and sea turtles in the TMAA.

Section 5.1.7 includes mitigation measures that are followed for all types of exercises; those that are associated with a particular type of training event; and those that apply generally to all Navy training at sea. For major exercises, the applicable mitigation measures are incorporated into a naval message which is disseminated to all of the units participating in the exercise or training event and applicable responsible commands. Appropriate measures are also provided to non-Navy participants (other DoD and allied forces) as information in order to ensure their use by these participants.

The extensive set of protective measures avoids, minimizes, and reduces potential adverse effects of surface, air, and subsurface training and testing activities on marine mammals. In general the protective measures include:

- Training personnel (watchstanders) to detect and report the presence of marine mammals so that activities can be stopped or altered to prevent conflicts or injuries.
- Maneuvering to keep at least 1,500 ft (500 yds) away from any observed whale in the vessel's path and avoid approaching whales head-on. These requirements do not apply if a vessel's safety is threatened, such as when change of course will create an imminent and serious threat to a person, vessel, or aircraft, and to the extent vessels are restricted in their ability to maneuver.
- Taking all practicable steps to alert other vessels in the vicinity of an observed whale.
- Conducting pre-training site surveys for events involving ordnance in the water to detect and clear training areas of marine mammals that might be affected by activities before training activities are initiated.
- Reducing sound from sonar when marine mammals are detected in the vicinity of naval activities.
- Adjusting, delaying or moving activities when marine mammals are detected in the area.

- Maintaining protective buffer zones around ships and other vessels when marine mammals are detected within established safety zone distances of ships and sonar exercises.
- Maintaining marine mammal exclusion zones around areas that involve at-sea explosions.
- Coordinating with NMFS before, during, and after major training exercises and reporting incidents that may have involved marine mammals.

The effectiveness of these protective measures was considered in determining the impacts of the proposed alternatives to marine mammals.

Navy shipboard lookouts (also referred to as "watchstanders") are highly qualified and experienced observers of the marine environment. Their duties require that they report all objects sighted in the water to the Officer of the Deck (e.g., trash, a periscope, marine mammals, sea turtles) and all disturbances (e.g., surface disturbance, discoloration) that may be indicative of a threat to the vessel and its crew. There are personnel serving as lookouts on station at all times (day and night) when a ship or surfaced submarine is moving through the water. Navy lookouts undergo extensive training in order to qualify as a lookout. This training includes on-the-job instruction under the supervision of an experienced lookout, followed by completion of the Personal Qualification Standard program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects).

The Navy also includes marine species awareness as part of its training for its bridge lookout personnel on ships and submarines. Lookouts are trained how to look for marine species, and report sightings to the Officer of the Deck so that action may be taken to avoid the marine species or adjust the exercise to minimize effects to the species. Marine Species Awareness Training (MSAT) was updated in 2006, and the additional training materials are now included as required training for Navy ship and submarine lookouts. This training addresses the lookout's role in environmental protection, laws governing the protection of marine species, Navy stewardship commitments, and general observation information to aid in avoiding interactions with marine species. Additionally, all Commanding Officers and Executive Officers (CO/XOs) of units involved in training exercises are also required to review the marine species awareness training material.

3.8.1.2 Alternative Mitigation Measures Considered but Eliminated

As described in Section 3.8.6, the vast majority of estimated sound exposures of marine mammals during proposed active sonar activities would not cause injury. Potential acoustic effects on marine mammals would be further reduced by the mitigation measures described in Section 5.1.7. Therefore, the Navy concludes the Proposed Action and mitigation measures would achieve the least practical adverse impact on species or stocks of marine mammals.

A determination of "least practicable adverse impacts" includes consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity in consultation with the DoD. Therefore, the following additional mitigation measures were analyzed and eliminated from further consideration:

- Reduction of training. The requirements for training have been developed through many years of iteration to ensure sailors achieve levels of readiness to ensure they are prepared to properly respond to the many contingencies that may occur during an actual mission. These training requirements are designed provide the experience needed to ensure sailors are properly prepared for operational success. There is no extra training built in to the plan, as this would not be an efficient use of the resources needed to support the training (e.g. fuel, time). Therefore, any reduction of training would not allow sailors to achieve satisfactory levels of readiness needed to accomplish their mission.

- Use of ramp-up to attempt to clear the range prior to the conduct of exercises. Ramp-up procedures, (slowly increasing the sound in the water to necessary levels), are not a viable alternative for training exercises because the ramp-up would alert opponents to the participants' presence. This affects the realism of training in that the target submarine would be able to detect the searching unit prior to themselves being detected, enabling them to take evasive measures. This would insert a significant anomaly to the training, affecting its realism and effectiveness. Though ramp-up procedures have been used in testing, the procedure is not effective in training sailors to react to tactical situations, as it provides an unrealistic advantage by alerting the target. Using these procedures would not allow the Navy to conduct realistic training, thus adversely impacting the effectiveness of the military readiness activity.
- Visual monitoring using third-party observers from air or surface platforms, in addition to the existing Navy-trained lookouts.
    - The use of third-party observers would compromise security due to the requirement to provide advance notification of specific times/locations of Navy platforms.
    - Reliance on the availability of third-party personnel would also impact training flexibility, thus adversely affecting training effectiveness.
    - The presence of other aircraft in the vicinity of naval exercises would raise safety concerns for both the commercial observers and naval aircraft.
    - Use of Navy observers is the most effective means to ensure quick and effective implementation of mitigation measures if marine species are spotted. A critical skill set of effective Navy training is communication. Navy lookouts are trained to act swiftly and decisively to ensure that appropriate actions are taken.
    - Use of third-party observers is not necessary because Navy personnel are extensively trained in spotting items on or near the water surface. Navy spotters receive more hours of training, and use their spotting skills more frequently, than many third-party trained personnel.
    - Crew members participating in training activities involving aerial assets have been specifically trained to detect objects in the water. The crew's ability to sight from both surface and aerial platforms provides excellent survey capabilities using the Navy's existing exercise assets.
    - Security clearance issues would have to be overcome to allow non-Navy observers onboard exercise participants.
    - Some training events will span one or more 24-hour periods, with operations underway continuously in that timeframe. It is not feasible to maintain non-Navy surveillance of these activities, given the number of non-Navy observers that would be required onboard.
    - Surface ships having active mid-frequency sonar have limited berthing capacity. As exercise planning includes careful consideration of this limited capacity in the placement of exercise controllers, data collection personnel, and Afloat Training Group personnel on ships involved in the exercise. Inclusion of non-Navy observers onboard these ships would require that in some cases there would be no additional berthing space for essential Navy personnel required to fully evaluate and efficiently use the training opportunity to accomplish the exercise objectives.
    - Contiguous ASW events may cover many hundreds of square miles. The number of civilian ships and/or aircraft required to monitor the area of these events would be considerable. It is, thus, not feasible to survey or monitor the large exercise areas in the time required ensuring these areas are devoid of marine mammals. In addition, marine mammals may move into or

out of an area, if surveyed before an event, or an animal could move into an area after an exercise took place. Given that there are no adequate controls to account for these or other possibilities and there are no identified research objectives, there is no utility to performing either a before or an after the event survey of an exercise area.

- Survey during an event raises safety issues with multiple, slow civilian aircraft operating in the same airspace as military aircraft engaged in combat training activities. In addition, most of the training events take place far from land, limiting both the time available for civilian aircraft to be in the exercise area and presenting a concern should aircraft mechanical problems arise.
- Scheduling civilian vessels or aircraft to coincide with training events would impact training effectiveness, since exercise event timetables cannot be precisely fixed and are instead based on the free-flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the unceasing progress of the exercise and impact the effectiveness of the military readiness activity.
- Multiple simultaneous training events continue for extended periods. There are not enough qualified third-party personnel to accomplish the monitoring task.

- Reducing or securing power during the following conditions.
  - Low-visibility / night training: ASW can require a significant amount of time to develop the "tactical picture," or an understanding of the battle space such as area searched or unsearched, identifying false contacts, understanding the water conditions, etc. Reducing or securing power in low-visibility conditions would affect a commander's ability to develop this tactical picture and would not provide realistic training.
  - Strong surface duct: The complexity of ASW requires the most realistic training possible for the effectiveness and safety of the sailors. Reducing power in strong surface duct conditions would not provide this training realism because the unit would be operating differently than it would in a combat scenario, reducing training effectiveness and the crew's ability. Additionally, water conditions may change rapidly, resulting in continually changing mitigation requirements, resulting in a focus on mitigation versus training.
- Vessel speed: Establish and implement a set vessel speed.
  - Navy personnel are required to use caution and operate at a slow, safe speed consistent with mission and safety. Ships and submarines need to be able to react to changing tactical situations in training as they would in actual combat. Placing arbitrary speed restrictions would not allow them to properly react to these situations, resulting in decreased training effectiveness and reduction the crew proficiency.
- Increasing power down and shut down zones:
  - The current power down zones of 457 and 914 m (500 and 1,000 yd), as well as the 183 m (200 yd) shut down zone were developed to minimize exposing marine mammals to sound levels that could cause TTS or PTS, levels that are supported by the scientific community. Implementation of the safety zones discussed above will prevent exposure to sound levels greater than 195 dB re 1µPa for animals sighted. The safety range the Navy has developed is also within a range sailors can realistically maintain situational awareness and achieve visually during most conditions at sea.
  - Although the three action alternatives were developed using marine mammal density data and areas believed to provide habitat features conducive to marine mammals, not all such areas could be avoided. ASW requires large areas of ocean space to provide realistic and

meaningful training to the sailors. These areas were considered to the maximum extent practicable while ensuring Navy's ability to properly train its forces in accordance with federal law. Avoiding any area that has the potential for marine mammal populations is impractical and would impact the effectiveness of the military readiness activity.

- Using active sonar with output levels as low as possible consistent with mission requirements and use of active sonar only when necessary.
  - Operators of sonar equipment are always cognizant of the environmental variables affecting sound propagation. In this regard, the sonar equipment power levels are always set consistent with mission requirements.
  - Active sonar is only used when required by the mission since it has the potential to alert opposing forces to the sonar platform's presence. Passive sonar and all other sensors are used in concert with active sonar to the maximum extent practicable when available and when required by the mission.

3.8.9 Summary of Effects

3.8.9.1 Endangered Species Act

The Navy is consulting with NMFS under Section 7 of the ESA regarding its determination of effect for federally-listed marine mammals and critical habitat. Table 3.8-18 provides a summary of the Navy's determination of acoustic effects for federally listed marine mammals that potentially occur in the TMAA. The analysis presented above indicates that all seven ESA-listed species of marine mammals may be affected by one or more stressors resulting from Alternative 2 (Preferred Alternative) training activities. All species may be affected by exposures to sound from sonar and at-sea explosions.

This assessment focused on five aspects of the proposed Navy training events—ship traffic, use of active sonar, other non-sonar acoustic sources, aircraft overflights, expended materials, and at-sea explosions. Potential risks associated with sonars and other non-sonar acoustic sources that are likely to be employed during anti-submarine warfare exercises were assessed by treating the acoustic energy produced by those sources as a pollutant introduced into the ocean environment. The acoustic analyses evaluated the likelihood of listed species being exposed to sound pressure levels associated with active sonar and other non-sonar acoustic sources, which includes estimating the intensity, duration, and frequency of exposure. The analysis assumed that active sonar and other non-sonar acoustic sources posed no risk to listed species if they were not exposed to sound pressure levels exceeding established regulatory thresholds. The analyses also assumed that the potential consequences of exposure to sonar and other non-sonar acoustic sources on individual animals would be a function of the intensity (measured in both SPL in decibels and frequency), duration, and frequency of the animal's exposure to the mid- and high frequency sonar transmissions and to other acoustic sources.

Potential risks associated with at-sea explosions that are likely to be employed during BOMBEX, GUNEX, SINKEX, and use of SSQ-110 sonobuoys were assessed by treating the impulse energy produced by at-sea explosions as an energy force introduced into the ocean environment. The at-sea explosion analysis evaluated the likelihood of ESA listed species being exposed to sound pressure levels associated with at-sea explosions, which includes estimating the intensity, duration, and frequency of exposure. The analysis assumed that the energy from at-sea explosions posed no risk to marine mammal species if they were not exposed to sound or pressure levels from the detonations.

There are no critical habitats in the TMAA and Navy training activities will not destroy or adversely modify critical habitat. There are no primary constituent elements of critical habitat present in the TMAA. Therefore, in accordance with ESA consultation provisions to assess potential effects of Proposed Action to critical habitat, it is concluded that Navy activities will have no effect on any critical habitats.

3.8.9.2 Marine Mammal Protection Act

The analysis presented above indicates that several species of marine mammals could be exposed to impacts associated with at-sea explosions and explosive ordnance use under Alternative 2 that could result in Level A or Level B harassment as defined by MMPA provisions that are applicable to the Navy. Exposure estimates are provided in Tables 3.8-8, 3.8-9, 3.8-12. 3.8-13, and 3.8-16. Other stressors associated with Alternative 2 are not expected to result in MMPA Level A or Level B harassment. It is not likely that any of the proposed training activities would result in effects to the life functions of marine mammals in the TMAA. Accordingly, the Navy is working with NMFS through the MMPA permitting process to ensure compliance with the MMPA.

3.8.9.3 National Environmental Policy Act and Executive Order 12114

Table 3.8-19 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on marine mammals under both NEPA and EO 12114.

Table 3.8-18: Summary of the Navy's Determination of Effect for Federally Listed Marine Mammals That May Occur in the TMAA – Alternative 2 (Preferred Alternative)

Stressor	Blue Whale	Fin Whale	Humpback Whale	North Pacific Right Whale	Sei Whale	Sperm Whale	Steller Sea Lion
Vessel Movements							
Vessel Disturbance	MA	MA	MA	MA	MA	MA	MA
Vessel Collisions	MA	MA	MA	MA	MA	MA	MA
Aircraft Overflights							
Aircraft Disturbance	MA	MA	MA	MA	MA	MA	MA
Non-explosive Practice Ordnance							
Weapons Firing Disturbance	MA	MA	MA	MA	MA	MA	MA
Non-explosive Ordnance Strikes	MA	MA	MA	MA	MA	MA	MA
High Explosive Ordnance							
At-Sea Explosion	MA	MA	MA	MA	MA	MA	MA
Explosive Ordnance	MA	MA	MA	MA	MA	MA	MA
Active Sources							
Mid- and High-Frequency Sonar	MA	MA	MA	MA	MA	MA	MA
Non-Sonar Acoustic Sources	MA	MA	MA	MA	MA	MA	MA
Expended Materials							
Ordnance Related Materials	MA	MA	MA	MA	MA	MA	MA
Chaff	MA	MA	MA	MA	MA	MA	MA
MK-58 Marine Markers	MA	MA	MA	MA	MA	MA	MA
Target Related Materials	MA	MA	MA	MA	MA	MA	MA
Sonobuoys	MA	MA	MA	MA	MA	MA	MA

MA = May Affect; TMAA = Temporary Maritime Activities Area

Table 3.8-19: Summary of Effects of the Alternatives

Alternative and Stressor	NEPA (U.S. Territorial Seas, 0 to 12 nm)	Executive Order 12114 (Non-Territorial Seas, >12 nm)
No Action	• Aircraft overflights of U.S. Territorial Seas would occur at altitudes at or above 15,000 ft (915 m) and have no effect on marine mammals.	**Vessel Movements** • Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. **Aircraft Overflights** • Potential for short-term behavioral responses to low level overflights. No long-term population-level effects. **Non-explosive Practice Ordnance** • Extremely low probability of direct strikes. **At-Sea Explosions** • Behavioral effects modeling and accounting for rare species indicates 102 MMPA Level B harassments (80 from sub-TTS and 22 from TTS), one MMPA Level A harassment resulting from slight injury, and no exposures resulting in potential severe injury or mortality. Mitigation would reduce the number of these harassments. With implementation of mitigation measures, the MMPA Level A harassment should not occur. **Active Sonar** • Not applicable **Expended Materials** • Low potential for ingestion of expended materials. **ESA-Listed Species** • All seven ESA-listed species of marine mammals may be affected by one or more stressors resulting from No Action Alternative training activities. All species may be affected by at-sea explosions.

Table 3.8-18: Summary of Effects of the Alternatives (continued)

Alternative and Stressor	NEPA (U.S. Territorial Seas, 0 to 12 nm)	Executive Order 12114 (Non-Territorial Seas, >12 nm)
Alternative 1	• Aircraft overflights of U.S. Territorial Seas would occur at altitudes at or above 15,000 ft (915 m) and have no effect on marine mammals.	**Vessel Movements** • Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. **Aircraft Overflights** • Potential for short-term behavioral responses to low level overflights. No long-term population-level effects. **Non-explosive Practice Ordnance** • Extremely **low probability of** direct strikes. **At-Sea Explosions** • Behavioral effects modeling and accounting for rare species indicates 137 MMPA Level B harassments (103 from sub-TTS and 34 from TTS), one MMPA Level A harassments from slight injury, and no exposures resulting in potential severe injury. Mitigation would reduce the number of these harassments. With implementation of mitigation measures, the one MMPA Level A harassments should not occur. **Active Sonar and Other Non-Sonar Acoustic Sources** • Behavioral effects modeling and accounting for rare species provided an estimate of zero exposures indicates 215,519 MMPA Level B harassments (215,053 from sub-TTS and 466 TTS) There is one predicted MMPA Level A harassment from PTS, but with implementation of mitigation measures, this MMPA Level A harassment should not occur. **Expended Materials** • Low potential for ingestion of expended materials. **ESA-Listed Species** • All seven ESA-listed species of marine mammals may be affected by one or more stressors resulting from Alternative 1 training activities. All species may be affected by exposures to sound from sonar and at-sea explosions.

Table 3.8-18: Summary of Effects of the Alternatives (continued)

Alternative and Stressor	NEPA (U.S. Territorial Seas, 0 to 12 nm)	Executive Order 12114 (Non-U.S. Territorial Seas, >12 nm)
Alternative 2 (Preferred Alternative)	• Aircraft overflights of U.S. Territorial Seas would occur at altitudes at or above 15,000 ft (915 m) and have no effect on marine mammals.	**Vessel Movements** • Short-term behavioral responses from general vessel disturbance possible. Potential for injury or mortality from vessel collisions but occurrence is very unlikely. **Aircraft Overflights** • Potential for short-term behavioral responses to low level overflights. No long-term population-level effects. **Non-explosive Practice Ordnance** • Extremely low probability of direct strikes. **At-Sea Explosions** • Behavioral effects modeling and accounting for rare species indicates 240 MMPA Level B harassments (170 from sub-TTS and 70 from TTS), four MMPA Level A harassments, and one exposure resulting in potential severe injury or mortality. Mitigation would reduce the number of these harassments. With implementation of mitigation measures, the four MMPA Level A harassments and one severe injury should not occur. • Increase in at-sea explosions from SINKEX are offset by area clearance procedures. **Active Sonar and Other Non-Sonar Acoustic Sources** • Behavioral effects modeling and accounting for rare species indicates 425,551 MMPA Level B harassments (424,620 from sub-TTS and 931 from TTS). There is one predicted MMPA Level A harassment from PTS, but with implementation of mitigation measures, this MMPA Level A harassment should not occur. **Expended Materials** • Low potential for ingestion of expended materials. **ESA-Listed Species** • All seven ESA-listed species of marine mammals may be affected by one or more stressors resulting from Alternative 2 training activities. All species may be affected by exposures to sound from sonar and at-sea explosions.

Notes: MAA = Temporary Maritime Activities Area, MMPA = Marine Mammal Protection Act, NEPA = National Environmental Protection Act, nm = nautical mile, PTS = Permanent Threshold Shift, SPL = Sound Pressure Level, TTS = Temporary Threshold Shift

3.9 Birds

3.9 BIRDS

3.9.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for birds is the Temporary Maritime Activities Area (TMAA) within the Gulf of Alaska (GOA). The nearest shoreline (Kenai Peninsula) is located approximately 24 nautical miles (nm) (44 kilometers [km]) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore. Given that the TMAA is more than 12 nm (22 km) from the closest point of land, it is therefore outside of United States (U.S.) Territorial Seas. Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999) and the *Transformation of U.S. Army Alaska FEIS* (Army 2004). Thus, this section provides an overview of the species, distribution, and occurrence of birds that are either resident or migratory through the TMAA.

3.9.1.1 Existing Conditions

The habitat found within the TMAA supports a wide diversity of resident and migratory seabirds and sea ducks. Since the TMAA occurs mostly over the outer shelf slope and deeper ocean waters, this area is dominated by species that use the region seasonally and are not land-based outside the nesting season. Birds that are year-round residents or that migrate from northern waters frozen over in the winter use the protected embayments of Kodiak Island and the mainland shoreline to avoid harsh winter storms (DoN 2006).

Migratory birds are any species or family of birds that live, reproduce, or migrate within or across international borders at some point during their annual life cycle. Seabirds, which are included in migratory birds protected by the Migratory Bird Treaty Act (MBTA, Section 3.9.2.2) (U.S. Fish and Wildlife Service [USFWS] 1985), are birds whose normal habitat and food source is the sea, whether they utilize coastal waters (the nearshore), offshore waters (the continental shelf), or pelagic waters (the open sea) (Harrison 1983).

The TMAA consists of open water surface and subsurface operating areas and overlying airspace to the south of Prince William Sound and east of Kodiak Island. The GOA is one of the world's most productive ocean regions and the habitats associated with these cold and turbulent waters contain identifiable collections of microhabitats that sustain resident and migratory species of seabirds. The waters of the GOA provide both protected shallow water habitat for seabirds and sea ducks, which forage on the sea bottom, and nutrient rich offshore areas for seabirds that rely on upwelling zones and shelf currents to transport prey to the surface. In general, seabird and sea duck distribution in the GOA is seasonally influenced by prey availability and probably weather patterns (Hunt and Schneider 1987). Since carbon flux for the benthic community is highest in the nearshore areas (Iverson et al. 1979), these waters provide good winter food sources for bottom-feeding ducks.

The GOA is a large ecosystem that lies off the southern coast of Alaska and the western coast of Canada. It is separated from the East Bering Sea by the Alaska Peninsula. Its climate is sub-Arctic. The cold Subarctic Current, as it bifurcates towards the south, serves as the boundary between the GOA and the California Current. Decadal climate change has shown an effect on plankton production and plankton species composition. The GOA ecosystem is a highly productive (>300 grams [g] of carbon per square meter [m^2] per year) ecosystem based on global primary productivity estimates (Sea-viewing Wide Field-of-view Sensor [SeaWiFS] 2008). It presents a significant upwelling phenomenon linked to the presence of the counterclockwise gyre of the Alaska Current (National Oceanic and Atmospheric Administration [NOAA] 2002). A well-documented climatic regime shift occurring in the late 1970s caused the Alaska

gyre to be centered more to the east (Lagerloef 1995). The LME's cold, nutrient-rich waters support a diverse ecosystem. Large-scale atmospheric and oceanographic conditions affect the productivity of this area. Changes in zooplankton biomass have been observed in both the GOA and the California Current directly to the south. These biomass changes appear to be inversely related to each other (Brodeur et al. 1999).

Many of the larger seabirds, especially the albatrosses and the shearwaters, move into the Gulf from more southern climates during the summer and fall months and feed along the Alaskan current as it traces the continental shelf break. Carbon flux in the pelagic food chain is greatest in the outer shelf (where bottom depth is 328 to 558 feet (ft) (100 to 170 meters [m]); Iverson et al. 1979), as upwelling brings deepwater nutrients to the surface, which stimulates planktonic growth. Hunt and Schneider (1987) found that the pelagic distribution of seabirds mirrored the distribution of plankton, regardless of the trophic level on which a particular species fed. Since the TMAA occurs mostly over outer shelf, slope, and deeper ocean waters, this area is dominated by those species that use the region seasonally and are not land-based outside the nesting season.

The USFWS, which oversees the National Wildlife Refuges (NWR) system, protects a significant amount of marine habitat within U.S. waters. Three NWRs (Alaska Maritime, Becharof, and Kenai) that contain a marine component are located throughout the GOA, though outside the TMAA. These NWRs provide over 3 million hectares of refuge for seabirds, shorebirds, migratory waterfowl, and a diverse array of marine mammals and flora. Together with federal agencies and legislation, the operation and management of Alaska NWRs is also influenced by policy documents such as the Alaska National Interest Lands Conservation Act of 1980 (USFWS 2004b).

Table 3.9-1 identifies bird species known to occur in or breed in the coastal zones within the GOA. Two of these are protected under the authority of the Endangered Species Act (ESA): one is federally listed as endangered (short-tailed albatross [*Phoebastria albatrus*]) and one is federally listed as threatened (Steller's eider [*Polysticta stelleri*]). Five species are not listed as threatened or endangered under the ESA but have been named Birds of Conservation Concern (BCC) by the USFWS. These are the black-footed albatross (*Phoebastria nigripes*), Laysan albatross (*Phoebastria immutabilis*), Aleutian tern (*Onychoprion aleuticus*), Arctic tern (*Sterna paradisaea*), and the Caspian tern (*Hydroprogne caspia*).

Other species are not listed but have been identified by agencies for different reasons. The black oystercatcher (*Haematopus bachmani*) is considered by the U.S. Shorebird Conservation Plan and its regional counterpart, the Alaska Shorebird Conservation Plan, as a species of high concern. Classification is due to the species' limited breeding distribution and small global populations (Brown et al. 2001). The Kittlitz's murrelet (*Brachyramphus brevirostris*) has been listed as a candidate species throughout its range as several core populations have been reduced by 80 to 90 percent in the past two decades.

Table 3.9-1: Representative Birds Known to Occur or Breed in the Coastal Zones within the GOA

Common Name	Genus and Species	Common Name	Genus and Species
Aleutian Tern[BCC, B]	*Onychoprion aleuticus*	Clark's Grebe	*Aechmophorus clarkii*
American Avocet	*Recurvirostra americana*	Common Eider	*Somateria mollissima*
American Golden-Plover	*Pluvialis dominica*	Common Goldeneye	*Bucephala clangula*
American Wigeon	*Anas americana*	Common Greenshank	*Tringa nebularia*
Ancient Murrelet[B]	*Synthliboramphus antiquus*	Common Loon	*Gavia immer*
Arctic Loon	*Gavia arctica*	Common Merganser	*Mergus merganser*
Arctic Tern[BCC,B]	*Sterna paradisaea*	Common Murre[B]	*Uria aalge*
Baird's Sandpiper	*Calidris bairdii*	Common Ringed Plover	*Charadrius hiaticula*
Barrow's Goldeneye	*Bucephala islandica*	Common Sandpiper	*Actitis hypoleucos*
Bar-tailed Godwit	*Limosa lapponica*	Cook's Petrel	*Pterodroma cookii*
Black Guillemot[B]	*Cepphus grylle*	Crested Auklet[B]	*Aethia cristatella*
Black Oystercatcher	*Haematopus bachmani*	Curlew Sandpiper	*Calidris ferruginea*
Black Scoter	*Melanitta americana*	Double-crested Cormorant[B]	*Phalacrocorax auritus*
Black Turnstone	*Arenaria melanocephala*	Dovekie[B]	*Alle alle*
Black-bellied Plover	*Pluvialis squatarola*	Dunlin	*Calidris alpina*
Black-footed Albatross[BCC, B]	*Phoebastria nigripes*	Emperor Goose	*Chen canagica*
Black-legged Kittiwake[B]	*Rissa tridactyla*	Eskimo Curlew	*Numenius borealis*
Black-tailed Godwit	*Limosa limosa*	Eurasian Dotterel	*Charadrius morinellus*
Black-winged Stilt	*Himantopus himantopus*	Eurasian Wigeon	*Anas penelope*
Blue-winged Teal	*Anas discors*	Far Eastern Curlew	*Numenius madagascariensis*
Bonaparte's Gull	*Chroicocephalus philadelphia*	Flesh-footed Shearwater	*Puffinus carneipes*
Brandt's Cormorant[B]	*Phalacrocorax penicillatus*	Fork-tailed Storm-Petrel[B]	*Oceanodroma furcata*
Brant[B]	*Branta bernicla*	Gadwall	*Anas strepera*
Bristle-thighed Curlew	*Numenius tahitiensis*	Glaucous Gull[B]	*Larus hyperboreus*
Broad-billed Sandpiper	*Limicola falcinellus*	Glaucous-winged Gull[B]	*Larus glaucescens*
Buff-breasted Sandpiper	*Tryngites subruficollis*	Gray-tailed Tattler	*Tringa brevipes*
Bufflehead	*Bucephala albeola*	Great Knot	*Calidris tenuirostris*
Buller's Shearwater	*Puffinus bulleri*	Greater Scaup	*Aythya marila*
Cackling Goose	*Branta hutchinsii*	Greater White-fronted Goose	*Anser albifrons*
Canada Goose	*Branta canadensis*	Greater Yellowlegs	*Tringa melanoleuca*
Canvasback	*Aythya valisineria*	Green Sandpiper	*Tringa ochropus*
Caspian Tern[BCC,B]	*Hydroprogne caspia*	Green-winged Teal	*Anas crecca*
Cassin's Auklet[B]	*Ptychoramphus aleuticus*	Harlequin Duck	*Histrionicus histrionicus*

Table 3.9-1: Representative Birds Known to Occur or Breed in the Coastal Zones within the GOA (continued)

Common Name	Genus and Species	Common Name	Genus and Species
Herring Gull[B]	*Larus argentatus*	Northern Shoveler	*Anas clypeata*
Hooded Merganser	*Lophodytes cucullatus*	Oriental Pratincole	*Glareola maldivarum*
Horned Grebe	*Podiceps auritus*	Pacific Golden-Plover	*Pluvialis fulva*
Horned Puffin[B]	*Fratercula corniculata*	Pacific Loon	*Gavia pacifica*
Hudsonian Godwit	*Limosa haemastica*	Parakeet Auklet[B]	*Aethia psittacula*
Jack Snipe	*Lymnocryptes minimus*	Parasitic Jaeger[B]	*Stercorarius parasiticus*
Killdeer	*Charadrius vociferus*	Pectoral Sandpiper	*Calidris melanotos*
King Eider	*Somateria spectabilis*	Pelagic Cormorant[B]	*Phalacrocorax pelagicus*
Kittlitz's Murrelet [C,BCC, B]	*Brachyramphus brevirostris*	Peregrine Falcon	*Falco peregrinus*
Laysan Albatross[BCC, B]	*Phoebastria immutabilis*	Pied-billed Grebe	*Podilymbus podiceps*
Leach's Storm-Petrel[B]	*Oceanodroma leucorhoa*	Pigeon Guillemot[B]	*Cepphus columba*
Least Auklet[B]	*Aethia pusilla*	Pink-footed Shearwater	*Puffinus creatopus*
Least Sandpiper	*Calidris minutilla*	Pin-tailed Snipe	*Gallinago stenura*
Lesser Scaup	*Aythya affinis*	Pomarine Jaeger[B]	*Stercorarius pomarinus*
Lesser Yellowlegs	*Tringa flavipes*	Purple Sandpiper	*Calidris maritima*
Little Curlew	*Numenius minutus*	Red Knot	*Calidris canutus*
Little Ringed Plover	*Charadrius dubius*	Red Phalarope	*Phalaropus fulicarius*
Little Stint	*Calidris minuta*	Red-breasted Merganser	*Mergus serrator*
Long-billed Dowitcher	*Limnodromus scolopaceus*	Red-faced Cormorant[B]	*Phalacrocorax urile*
Long-tailed Duck	*Clangula hyemalis*	Redhead	*Aythya americana*
Long-tailed Jaeger[B]	*Stercorarius longicaudus*	Red-legged Kittiwake[B]	*Rissa brevirostris*
Long-toed Stint	*Calidris subminuta*	Red-necked Grebe	*Podiceps grisegena*
Mallard	*Anas platyrhynchos*	Red-necked Phalarope	*Phalaropus lobatus*
Manx Shearwater	*Puffinus puffinus*	Red-throated Loon	*Gavia stellata*
Marbled Godwit	*Limosa fedoa*	Rhinoceros Auklet[B]	*Cerorhinca monocerata*
Marbled Murrelet[B]	*Brachyramphus marmoratus*	Ring-necked Duck	*Aythya collaris*
Marsh Sandpiper	*Tringa stagnatilis*	Rock Sandpiper	*Calidris ptilocnemis*
Mew Gull[B]	*Larus canus*	Ruddy Turnstone	*Arenaria interpres*
Mongolian Plover	*Charadrius mongolus*	Ruff	*Philomachus pugnax*
Mottled Petrel	*Pterodroma inexpectata*	Rufous-necked Stint	*Calidris ruficollis*
		Sabine's Gull[B]	*Xema sabini*
Northern Fulmar[B]	*Fulmarus glacialis*	Sanderling	*Calidris alba*
Northern Pintail	*Anas acuta*	Semipalmated Plover	*Charadrius semipalmatus*

Table 3.9-1: Representative Birds Known to Occur or Breed in the Coastal Zones within the GOA (continued)

Common Name	Genus and Species	Common Name	Genus and Species
Semipalmated Sandpiper	*Calidris pusilla*	Temminck's Stint	*Calidris temminckii*
Sharp-tailed Sandpiper	*Calidris acuminata*	Terek Sandpiper	*Xenus cinereus*
Short-billed Dowitcher	*Limnodromus griseus*	Thick-billed Murre [B]	*Uria lomvia*
Short-tailed Albatross[E, B]	*Phoebastria albatrus*	Trumpeter Swan	*Cygnus buccinator*
Short-tailed Shearwater[B]	*Puffinus tenuirostris*	Tufted Puffin[B]	*Fratercula cirrhata*
Slaty-backed Gull[B]	*Larus schistisagus*	Tundra Swan	*Cygnus columbianus*
Snow Goose	*Chen caerulescens*	Upland Sandpiper	*Bartramia longicauda*
Snowy Plover	*Charadrius alexandrinus*	Wandering Tattler	*Tringa incana*
Solitary Sandpiper	*Tringa solitaria*	Western Grebe	*Aechmophorus occidentalis*
Sooty Shearwater [B]	*Puffinus griseus*	Western Sandpiper	*Calidris mauri*
Spectacled Eider	*Somateria fischeri*	Whimbrel	*Numenius phaeopus*
Spoonbill Sandpiper	*Eurynorhynchus pygmeus*	Whiskered Auklet[B]	*Aethia pygmaea*
Spotted Redshank	*Tringa erythropus*	White-rumped Sandpiper	*Calidris fuscicollis*
Spotted Sandpiper	*Actitis macularius*	White-winged Scoter	*Melanitta fusca*
Steller's Eider[T]	*Polysticta stelleri*	Wilson's Phalarope	*Phalaropus tricolor*
Stilt Sandpiper	*Calidris himantopus*	Wilson's Snipe	*Gallinago delicata*
Surf Scoter	*Melanitta perspicillata*	Wood Sandpiper	*Tringa glareola*
Surfbird	*Aphriza virgata*	Yellow-billed Loon	*Gavia adamsii*

Notes: [E] Endangered, [T] Threatened, [C] Candidate Species, [BCC] Bird of Conservation Concern, [B] Breeding

Based loosely on their geographic distribution and feeding habits, birds observed in the TMAA are divided into two groups, (Department of Commerce [DOC] 1993), seabirds and waterfowl.

- Seabirds, such as alcids, shearwaters, and gulls. These feed in open waters ranging from the shoreline and estuaries to the open ocean. Some seabirds are strictly pelagic, while others prefer the nearshore environment.
- Waterfowl, such as ducks and geese. These familiar species are found near shore on the open coast and in estuaries, but some also use inland freshwater habitats.

In general, seabird activity is most concentrated along the GOA coastline, while waterfowl are found primarily in the bays and shallow waters of the southern coast (DOC 1993). Waterfowl (e.g., ducks and geese) can be hunted, but seasons and bag limits are established in federal and/or state regulations.

Seabirds

The seabird colonies off the coast of Alaska are among the largest in population in the continental United States. About 50 million seabirds nest on Alaska's coast each summer; this is 87 percent of all the seabirds in the United States (USFWS 2008). Alaska's seabirds nest in more than 1,600 seabird colonies around the coast of Alaska due to the fact that the State's coast is very long (approximately 30,000 miles [mi]), the coast has many cliffs and islands that provide habitat for nesting seabirds, and the nearby seas

(Bering Sea, Gulf of Alaska, and north Pacific Ocean) provides an abundant food source for the species (USFWS 2008).

Seabirds known to occur within the GOA include those that are pelagic (generally foraging far offshore over the continental shelf and in oceanic waters) and those that feed in nearshore zones. Pelagic seabirds go ashore primarily to breed (Piatt and Springer 2003). Pelagic species include albatross, petrels, shearwaters, cormorants, jaegers, skuas, gulls, terns, and alcids. Nearshore seabirds feed within sight of land and include Pacific (*Gavia pacifica*) and red-throated loons (*Gavia stellata*), western grebes (*Aechmorphorus occidentalis*), brown pelicans, several species of gulls and cormorants, common murres (*Uria aalge*), and red-necked phalaropes (*Phalaropus lobatus*). Coastal rocks, headlands, and islands along the outer coast are critical nesting and roosting sites for many seabird species (DOC 1993). Colony sites are important habitat for seabirds because reproductive success and continuation of species depend on these sites.

Alcids are a distinctive family of seabirds present in the GOA and along the coast that includes the tufted puffin (*Fratercula cirrhata*), rhinoceros auklet (*Cerorhinca monocerata*), Cassin's auklet (*Ptychoramphus aleuticus*), common murre, ancient murrelet (*Synthliboramphus antiquus*), marbled murrelets (*Brachyramphus marmoratus*), and pigeon guillemot (*Cepphus columba*) (DoC 1993). They are long-lived colonial nesters that reproduce slowly and are found in shallower nearshore waters, especially in summer when birds are closely tied to nesting sites (DOC 1993). Large colonies of tufted puffins, rhinoceros auklets, cassin's auklets, and common murres are present on the Aleutian islands. Common murres are circumpolar and number in the millions worldwide. They are the dominant member of the breeding seabird community on the west coast. They nest on open rock or dirt ledges along the Alaskan outer coast and sometimes shift colony sites. These birds are strong fliers and forage long distances from their colonies. They dive to considerable depths to capture fish, crustaceans, and cephalopods. In late summer and fall, adult females of the Washington coastal population fly into Puget Sound to molt and winter (DOC 1993).

The following ESA-listed and ESA-candidate species seabird species are known to occur in the GOA:

Short-tailed Albatross

The short-tailed albatross is the largest of the three north Pacific albatrosses (Harrison 1984). Adult short-tailed albatrosses are distinguishable from other Pacific albatrosses by their entirely white back and large bubble-gum pink bill that is strongly hooked at the end (Roberson 2000).

The short-tailed albatross was listed as endangered throughout its range under the ESA in 2000 (USFWS 2000). There is no designated critical habitat under ESA for the short-tailed albatross. During the late 1800s, the world population of short-tailed albatrosses was severely reduced by aggressive hunting for their plumage, resulting in the death of an estimated five million birds. Short-tailed albatrosses nest on isolated, windswept, offshore islands owned and administered by Japan that have restricted human access. The population has been rebounding in recent years because several Pacific rookeries have been protected from human use. The world population of short-tailed albatross is currently estimated at approximately 1,200 birds and is increasing (USFWS 2001).

Current human-induced threats include hooking and drowning on commercial long-line gear, entanglement in derelict fishing gear, ingestion of plastic debris, contamination from oil spills, and potential predation by introduced mammals on breeding islands (USFWS 2001). Plastic bags and plastic sheeting are most commonly swallowed by birds but balloons, Styrofoam beads, monofilament fishing line, and tar are also known to be ingested (Lutz 1990, Bjorndal et al. 1994, Tomas 2002). Invasive species at colonies, including cats, rats, and plants, also can be a significant source of mortality (USFWS 2005).

Short-tailed albatrosses have a lifespan of more than 40 years. Sexual maturity is reached at age 7 or 8 (Harrison 1990, USFWS 2001). The nesting season lasts from August to December on two rugged islands in Japan in October, with the hatching of a single egg occurring in late December and January. Both adults incubate the egg during this period. Fledging occurs in late April to early June, and the colony is totally deserted by mid-July (Roberson 2000). This species disperses throughout the north Pacific when it is not breeding.

Short-tailed albatrosses are pelagic wanderers, traveling thousands of miles at sea during the nonbreeding season (DoN 2006). Foraging occurs over open, offshore, ocean waters (DoN 2006). Most of their travel is concentrated along the continental shelf edge upwelling zones where they forage, utilizing shallow dives between 15 and 40 ft (4.5 and 12 m) in depth, on squid, fish, shrimp and other crustaceans, and flying-fish eggs (USFWS 2005). Their at-sea distribution includes the entire Pacific north of about 20°N, but they tend to concentrate along the Aleutians in the Bering Sea (Piatt et al. 2006).

Historic records indicate frequent use of nearshore and coastal waters in the eastern north Pacific from California through Alaska (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2002, USFWS 2001). Current sightings in the eastern north Pacific and in the TMAA are concentrated offshore of Alaska and British Columbia. Sightings off the continental United States are gradually increasing as the population rebounds (Unitt 2004). Sightings of short-tailed albatross have the potential to increase in frequency as the species continues recovering.

Kittlitz's Murrelet

The Kittlitz's murrelet, *Brachyramphus brevirostris*, a small diving bird in the family Alcidae, may today be the rarest seabird regularly breeding in Alaska. Current population estimates range from 9,000-25,000 birds (USFWS 2003). The Kittlitz's murrelet has undergone steep population declines in several of its core population areas. Reasons for the population declines have not been conclusively determined. Because the species may warrant listing as threatened or endangered under the Endangered Species Act, the U.S. Fish and Wildlife Service named the murrelet as a candidate for protection under the Act in 2004 (USFWS 2004a).

Most of the world population inhabits Alaskan waters, with an estimated 5% of the remaining birds in eastern Siberia (Day et al. 1999). Anecdotal accounts of birds at sea and standardized surveys in a few areas suggested that Kittlitz's murrelets were declining in coastal areas of the northern Gulf of Alaska (GOA) at least since the early 1970s (USFWS 2003). Small breeding populations of Kittlitz's murrelet occur along the Aleutian Islands and as far north as the central Chuckchi Sea (Day et al. 1999). However, most of the Alaska population appears to have a quite restricted set of habitat preferences, being primarily found near tidewater glaciers or in nearshore waters with glacial runoff (Day et al. 1999, Kulentz et al. 2003).

As these population cores are north of the TMAA, Kittlitz's murrelets are not likely to be present in the TMAA or be affected by any of the proposed activities and will not be considered further in this analysis.

Waterfowl

Waterfowl are flat-billed birds that spend most of their lifecycle on the water (DOC 1993). Waterfowl typically breed in freshwater habitats, but many species move to shoreline or nearshore habitats when breeding is complete. Many species of waterfowl stage and winter in Alaskan waters and winter in the western Arctic plain. Species such as the harlequin duck (*Histronicus histronicus*), scoters (*Melanitta* sp.), bufflehead (*Bucephala albeola*), mergansers, goldeneyes, long-tailed duck (*Clangula hyemalis*), and scaup winter in the nearshore waters of the open coast (DOC 1993). Scoters and eiders are by far the most

numerous species of sea ducks in nearshore waters, with all four species of eider, king (*Somateria spectabilis*), common (*S. mollissima*), Steller's and spectacled (*S. fischeri*) breeding in Alaska.

The following ESA-listed waterfowl species is known to occur in the GOA:

Steller's Eider

The Alaska breeding population of Steller's eiders was listed as threatened under ESA on June 11, 1997 (62 FR 31748). Steller's eiders are not expected to occur in the TMAA, and there is no critical habitat or foraging areas in or within the vicinity of the TMAA. During the months of April to October, when the training activities are planned to occur, Steller's eiders can be found in nearshore areas, and in particular protected lagoons with tidal flats located hundreds of miles to the northwest and west of the TMAA (Alaska Department of Environmental Conservation 2009). During the winter, the distribution of Steller's eiders includes the nearshore areas around Kodiak Island, Cook Inlet, the southern side of the Alaska Peninsula, and the eastern Aleutian Islands. Though these areas are north and west of the TMAA, there will be no Navy activities in the TMAA during the winter. Therefore, Steller's eiders are not likely to be present in the TMAA or be affected by any of the proposed activities and will not be considered further in this analysis.

Hearing Capabilities of Birds

While little is known about the general hearing or underwater hearing capabilities of birds, research suggests an in-air maximum auditory sensitivity between 1 and 5 kilohertz (kHz) for most bird species (National Marine Fisheries Service [NMFS] 2003). It is possible that birds are likely to hear some mid-frequency sound in air. However, there is little published literature on the effects of underwater sound on diving birds. A review of available literature shows that most research focused on effects of pile-driving and seismic surveys. During such studies, airguns did not cause harm to birds. Similarly explosives used during ship shock trials did not cause harm unless birds were within 200 meters of the detonation site (Turnpenny and Nedwell 1994).

NMFS issued an environmental assessment with regards to the harassment of marine mammals in 2003 in accordance with the Marine Mammal Protection Act of 1972 (MMPA). As part of the environmental documentation, birds were analyzed for potential effects associated with exposure to active sonar. The operating frequency of the system was greater than 20 kHz, with a maximum source level at or less than 220 decibels (dB) at a reference pressure of 1 microPascal at 1 meter (re 1 µPa-m) in individual pulses less than 1 second for a duty cycle (time on over total time) of less than 10 percent. For example, in an 8-hour day, maximum sonar use would be less than 48 minutes (NMFS 2003). The potential hearing capability of birds was outside the proposed high frequency of the operating system and there is no evidence that birds utilize sound underwater to forage or locate prey (NMFS 2003). Thus, it was concluded that effects were unlikely. In addition, birds would not be an effective receptor because they are submerged only for short periods and birds at the surface can rapidly fly away from disturbance and annoying sounds.

3.9.1.2 Current Requirements and Practices

Standard operating procedures and best management practices implemented by the Navy for resource protection would reduce potential effects to birds. Avoidance of birds and their nesting and roosting habitats provides the greatest degree of protection from potential impacts within the TMAA or coastal areas of the GOA. For example, pursuant to Navy instruction (OPNAVINST) 3750.6R, measures to evaluate and reduce or eliminate bird/aircraft strike hazards to aircraft, aircrews, and birds are implemented during operations in the TMAA. See Chapter 5 for details.

3.9.2 Environmental Consequences

As noted in Section 3.9.1, the ROI for birds includes the TMAA. Navy training activities that occur within the Air Force inland Special Use Airspace (SUA) and the Army inland training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nautical nm [22 km]) are analyzed in this EIS/OEIS pursuant to Executive Order (EO) 12114.

3.9.2.1 Previous Analyses

Impacts related to birds were previously evaluated in Sections 3.5 and 4.5 of the *Alaska MOA EIS* (USAF 1995), Sections 3.3 and 4.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), Sections 3.12 and 4.12 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999); and Sections 3.9, 3.10, 4.9, and 4.10 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.9.2.2 Regulatory Framework

Migratory Bird Treaty Act

The MBTA of 1918 (16 U.S.C. 703 et seq.) and the Migratory Bird Conservation Act (16 U.S.C. 715–715d, 715e, 715f–715r) of 18 Feb 29, (45 Stat. 1222) are the primary legislation in the United States established to conserve migratory birds. These statutes implement the United States' commitment to four bilateral treaties, or conventions, for the protection of a shared migratory bird resource. Current treaties are with the countries of Great Britain, Mexico, Canada, Japan, and the Soviet Union. The MBTA prohibits the taking, killing, or possessing of migratory birds or the parts, nests, or eggs of such birds, unless permitted by regulation. The species of birds protected by the MBTA appears in Title 50, Section 10.13 of the Code of Federal Regulations (50 C.F.R. 10.13) and represents almost all avian families found in North America. In general, there are only three species that are not protected by the MBTA and they include the rock pigeon (*Columba livia*), European starling (*Sturnus vulgaris*), and house sparrow (*Passer domesticus*).

On December 2, 2003, the President signed the 2003 National Defense Authorization Act. The Act provides that the Secretary of the Interior shall exercise his/her authority under the MBTA to prescribe regulations to exempt the Armed Forces from the incidental taking of migratory birds during military readiness activities authorized by the Secretary of Defense. Take under the MBTA is defined to be "unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to barter, barter, offer to purchase, purchase, deliver for shipment, ship, export, import, cause to be shipped, exported, or imported, deliver for transportation, transport or cause to be transported, carry or cause to be carried, or receive for shipment, transportation, carriage, or export, any migratory bird, any part, nest, or eggs of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof, included in the terms of the conventions between the United States and Great Britain for the protection of migratory birds concluded August 16, 1916 (39 Stat. 1702), the United States and Mexico for the protection of migratory birds and game mammals concluded February 7, 1936, the United States and the Government of Japan for the protection of migratory birds and birds in danger of extinction, and their environment concluded March 4, 1972 and the convention between the United States and the Union of Soviet Socialist Republics for the conservation of migratory birds and their environments concluded November 19, 1976."

The final rule authorizing the Department of Defense (DoD) to take migratory birds during military readiness activities was published in the Federal Register on February 28, 2007. The regulation can be

found at 50 C.F.R. Part 21. The regulation provides that the Armed Forces must confer and cooperate with the USFWS on the development and implementation of conservation measures to minimize or mitigate adverse effects of a military readiness activity if it determines that such activity may have a "significant adverse effect" on a population of a migratory bird species. An activity has a significant adverse effect if, over a reasonable period of time, it diminishes the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem. A population is defined as "a group of distinct, coexisting, same species, whose breeding site fidelity, migration routes, and wintering areas are temporally and spatially stable, sufficiently distinct geographically (at some point of the year), and adequately described so that the population can be effectively monitored to discern changes in its status." Virtually all bird species found within the TMAA and coastal areas of the GOA are covered by the MBTA (exceptions are noted above). Two of the species covered under the MBTA are also federally listed as threatened or endangered and have additional protection under the ESA.

Migratory bird conservation relative to non-military readiness activities is addressed separately in a Memorandum of Understanding (MOU) developed in accordance with EO 13186, signed January 10, 2001, "Responsibilities of Federal Agencies to Protect Migratory Birds." This document encourages conservation measure integration into regional or state management plans, management of military lands to support conservation measures, avoidance or minimization of impacts to migratory birds, and the periodic evaluation of conservation measurements. The MOU between the DoD and the USFWS was signed on July 31, 2006.

Endangered Species Act

As the TMAA is more than 12 nm (22 km) from the closest point of land and thus outside of U.S. territorial seas, this EIS/OEIS analyzes potential effects to birds in the context of the ESA, NEPA, and EO 12114. For purposes of ESA compliance, effects of the action were analyzed to make the Navy's determination of effect for listed species (i.e., no effect or may affect). The definitions used in making the determination of effect under Section 7 of the ESA are based on the USFWS and NMFS *Endangered Species Consultation Handbook* (USFWS and NMFS 1998).

"No effect" is the appropriate conclusion when a listed species will not be affected, either because the species will not be present or because the project does not have any elements with the potential to affect the species. "No effect" does not include a small effect or an effect that is unlikely to occur.

If effects are insignificant (in size) or discountable (extremely unlikely), a "may affect but not likely to adversely affect" determination is appropriate. Insignificant effects relate to the magnitude or extent of the impact (that is, they must be small and would not rise to the level of a take of a species). Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur. These factors were also considered in determining the significance of effects EO 12114.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c), enacted in 1940 and amended several times since, prohibits anyone without a permit issued by the Secretary of the Interior from "taking" bald eagles, including their parts, nests, or eggs. The Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." However, bald eagles are not expected in the TMAA due to lack of proximity (> 12 nm [22 km]) to the Alaskan shoreline. As such, there is little indication that military activities in the TMAA will result in the take of bald eagles and therefore a permit is not needed. For these reasons, bald eagles are discounted from any further analysis and will not be discussed further in this document.

3.9.2.3 Approach to Analysis

Data Sources

A systematic review of relevant literature and data has been conducted to complete this analysis for seabirds. Of the available scientific literature (both published and unpublished), the following types of documents were utilized in the assessment: journals, books, periodicals, bulletins, DoD operations reports, theses, dissertations, endangered species recovery plans, species management plans, and other technical reports published by government agencies, private businesses, or consulting firms. The scientific literature was also consulted during the search for geographic location data (geographic coordinates) on the occurrence of marine resources within the TMAA and the coastal environments of the GOA.

Assessment Methods

The analysis considered effects on seabirds as a group from:

- Vessel movements;
- Aircraft overflights, including aircraft disturbance (such as noise) and aircraft strikes on birds;
- Ordnance use;
- Explosions and impacts; and
- Expended materials, including ordnance-related materials, target-related materials, and entanglement.

Each of the species that was identified as a federally listed threatened and/or endangered, or candidate species was then individually evaluated for each of these stressors. An assessment was not conducted on the effects of sonar on seabirds. As described in Section 3.9.1.1 (Hearing in Birds), a study documented by NMFS (2003) concluded that effects to seabirds from sonar were unlikely. Although some species may be able to hear sonar, several factors combine to make effects improbable, most notably the fact that seabirds spend a very small fraction of time submerged and most return to the surface within seconds of diving. Because seabirds spend relatively little time beneath the water surface, there would be a low likelihood of seabird exposure. Given that there is no evidence of sonar causing harm to seabirds, this issue is not addressed further in the analysis of effects on this resource.

As discussed in Section 3.1 (Air Quality) and Section 3.3 (Water Resources), some air and water pollutants would be released into the environment as a result of the Proposed Action. The analyses presented in Sections 3.1 and 3.3 indicate that any increases in air or water pollutant concentrations resulting from Navy training activities in the TMAA would be negligible and localized, and impacts to air and water quality would be minor. Based on these analyses, air and water quality changes would have no effect or negligible effects on birds. Accordingly, the effects of air and water quality changes on birds are not addressed further in this section.

As previously discussed in Section 3.9.2.2, military readiness activities are exempt from the take prohibitions of the MBTA provided they do not result in a significant adverse effect on a population of a migratory bird species. The migratory bird species that are protected under ESA are discussed in the analyses that follow.

3.9.2.4 No Action Alternative

Under the No Action Alternative, baseline levels of activities would remain unchanged from current conditions. Birds would have the potential to be affected by vessel movement, aircraft overflights, weapons firing/non-explosive ordnance use, explosive ordnance, and expended materials.

Vessel Movements

Many of the ongoing and proposed activities within the TMAA involve maneuvers by various types of surface ships and submarines (collectively referred to as vessels). Currently, the number of Navy vessels participating in training under the No Action Alternative is 23, consisting of 4 military vessels and up to 19 contracted vessels and boats, but can vary based on training schedules and scenarios. Activities involving vessel movements occur intermittently and are short in duration, generally a few hours in duration. These activities are widely dispersed throughout the TMAA, which is a vast area encompassing 42,146 square nautical miles (nm^2) (144,557 square kilometers [km^2]) of surface/subsurface ocean. Ship movements on the ocean surface have the potential to affect birds by disturbing or striking individual animals. The probability of ship and seabird interactions occurring in the TMAA depends on several factors, including the presence and density of birds; numbers, types, and speeds of vessels; duration and spatial extent of activities; and protective measures implemented by the Navy.

Birds respond to moving vessels in various ways. Some species, such as gulls and albatross, commonly follow vessels (Hamilton 1958, Hyrenbach 2001, Hyrenbach 2006), while other species, such as plovers and curlews, seem to avoid vessels (Borberg et al. 2005, Hyrenbach 2006). Vessel movements could elicit brief behavioral or physiological responses, such as alert response, startle response, or fleeing the immediate area, such responses typically conclude as rapidly as they occur. However, the general health of individual birds is not compromised (see additional discussion of these responses below for aircraft overflights).

Direct collisions with vessels or a vessel's rigging, such as wires, poles, or masts, could result in bird injury or mortality. Bird/vessel collisions are probably rare events during daylight hours, but the possibility of collisions could increase at night, especially during inclement weather. Birds can become disoriented at night in the presence of artificial light (Black 2005), and lighting on vessels may attract some birds (Hunter et al. 2006), increasing the potential for harmful encounters.

Based on the low density of Navy vessels and the high mobility of birds, the probability of bird/vessel collisions is low. Navy mitigation measures (see Chapter 5), which include avoidance of seabird colonies and habitats where birds may concentrate, would further reduce the probability of bird/vessel collisions. In accordance with EO 12114, harm to birds from vessel movements in nonterritorial seas (beyond 12 nm [22 km]) would be unlikely.

Short-tailed albatross exposure to vessels could occur while foraging or migrating in open water environments within the TMAA. Periods of exposure of individual birds would be extremely short given the low density and constant movement of naval vessels at sea. If birds were to respond to vessel movements, the responses would be limited to short-term behavioral or physiological reactions. Direct collisions with vessels or a vessel's rigging could result in bird injury or mortality, but is unlikely based on the low density of Navy vessels and the high mobility of birds. In accordance with the ESA, vessel movements under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabirds.

Aircraft Overflights

Aircraft Disturbance

Various types of fixed-wing aircraft and helicopters are used in training activities throughout the TMAA. For this reason, birds in the TMAA could be exposed to airborne noise associated with these aircraft. Numerous studies have documented that birds respond to anthropogenic noise, including aircraft overflights, weapons firing, and explosions (National Park Service [NPS] 1994, Larkin 1996, Plumpton 2006). The manner in which birds respond to noise depends on several factors, including life-history characteristics of the species, characteristics of the noise source, loudness, onset rate, distance from the noise source, presence or absence of associated visual stimuli, and previous exposure.

Researchers have documented a variety of behavioral responses of birds to noise, such as alert behavior, startle response, flying or swimming away, diving into the water, and increased vocalizations. While they are difficult to measure in the field, some of these behavioral responses are likely accompanied by physiological responses, such as increased heart rate, or stress (NPS 1994). Chronic stress can compromise the general health of birds, but stress does not necessarily result in negative consequences to individual birds or to populations (NPS 1994; Larkin 1996). For example, the reported behavioral and physiological responses of birds to noise exposure are within the range of normal adaptive responses to external stimuli, such as predation, that birds face on a regular basis. Unless they are repeatedly exposed to loud noises or simultaneously exposed to a combination of stressors, individuals may return to normal behavior and physiology almost immediately after exposure. Studies also have shown that birds can become habituated to noise following frequent exposure and cease to respond behaviorally to the noise (NPS 1994; Larkin 1996; Plumpton 2006); however, such frequent exposure is not anticipated to occur in the TMAA.

Under the No Action Alternative, most overflights would occur over marine environments, at elevations in excess of 15,000 ft (4,752 m) above mean sea level (MSL), and beyond 20 nm (37 km) from shore. Bird exposure to aircraft noise would be brief as aircraft quickly passed overhead. Exposures would be infrequent to seabirds and practically nonexistent to waterfowl based on the distance of the TMAA from coastal environments, large operational area of the TMAA, dispersed nature of the overflights, and the low probability of repeated exposure of individual birds over a short period of time (hours or days).

Most documented responses of birds have been to low-level aircraft overflights occurring below 3,000 ft (914 m) (NPS 1994). Unlike the situation at a busy commercial airport or military landing field, repeated exposure of individual birds or groups of birds is unlikely within the TMAA based on the dispersed nature of the overflights. If birds were to respond to an overflight, the responses would be limited to brief behavioral or physiological reactions and the general health of individual birds would not be compromised. Aircraft transiting between the TMAA and inland special use areas do so within a designated corridor that is above 15,000 ft (4,752 m), well above altitudes that would cause an exposure to birds near the surface from aircraft noise.

Unlike fixed-wing aircraft, helicopter training activities often occur at low altitudes (75 to 100 ft [22.8 to 30 m]), which increases the likelihood that birds would respond to helicopter overflights. In addition, some studies have suggested that birds respond more to noise from helicopters than that from fixed-wing aircraft (Larkin 1996; Plumpton 2006). Noise from low-altitude helicopter overflights would be expected to elicit brief behavioral or physiological responses in exposed birds. Repeated exposure of individual birds or groups of birds would be unlikely, based on the distance of the TMAA from coastal environments, large operational area of the TMAA, and the dispersed nature of the overflights. The general health of individual birds would not be compromised.

Aircraft noise under the No Action Alternative would not adversely affect populations of migratory birds and their habitat. Aircraft noise over territorial seas would have minimal impacts on birds. In accordance with EO 12114, aircraft noise over nonterritorial seas would not cause considerable harm to birds.

Short-tailed albatross exposure to aircraft noise could occur while foraging or migrating in open water environments within the TMAA. Periods of elevated noise levels would be brief and repeated exposure of individual birds would be extremely short given the constant movement of naval vessels at sea. If birds were to respond to an overflight, the responses would be limited to short-term behavioral or physiological reactions. In accordance with the ESA, aircraft noise under the No Action Alternative may affect but is not likely to adversely affect ESA-listed seabirds.

Aircraft Strikes

Aircraft strikes on birds are a major concern for the Navy because they can cause harm to aircrews, damage equipment, and produce bird mortality. During maritime operations, OPNAVINST 3750.6R identifies measures to evaluate and reduce or eliminate bird/aircraft strike hazards to aircraft, aircrews, and birds and requires the reporting of all strikes when damage or injuries occur as a result of a bird – aircraft strike. However, the numbers of bird deaths that occur annually from all Navy activities are insignificant from a bird population standpoint. From 2002 through 2004, an annual average of 596 known wildlife/aircraft strike events occurred Navy-wide. While most of these involved birds (Navy Safety Center [NSC] 2004), only five of the known bird strikes occurred involving vessel-based aircraft.

While bird strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often over land or close to shore. The potential for bird strikes to occur in offshore areas is relatively low because activities are widely dispersed and at relatively high altitudes (above 15,000 ft [4,752 m] for fixed-wing aircraft) where bird densities are low. Approximately 95 percent of bird flight during migrations occurs below 10,000 ft (3,048 m) with the majority below 3,000 feet (914 m) (USGS 2006). Aircraft transiting between the TMAA and inland special use areas do so within a designated corridor that is above 15,000 ft (4,752 m), in regions where bird density is extremely low.

Aircraft strikes under the No Action Alternative would not adversely affect migratory bird populations and their habitat. Aircraft strikes over territorial seas are not anticipated and would have minimal impacts on birds. In accordance with EO 12114, harm to birds from aircraft strikes over nonterritorial seas would not be expected.

Short-tailed albatross could be exposed to airborne noise associated overflights and to potential aircraft strike. Fixed wing aircraft overflights generally occur at altitudes above that where albatross are present. Additionally, Navy helicopter pilots are vigilant with regard to strike hazards and avoid interactions with birds. Aircraft strikes under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabirds.

Weapons Firing Nonexplosive Ordnance Use

Current Navy training activities in the TMAA include firing a variety of weapons. As listed in Table 3.9-2, these weapons employ a variety of nonexplosive and explosive training rounds, including bombs, missiles, naval gun shells, cannon shells, and small caliber ammunition. These materials are used in the open ocean beyond 12 nm (22 km) from shore. These activities account for the majority of naval shells and rounds used in the TMAA.

Direct ordnance strikes from firing weapons are a potential, but unlikely, stressor to seabirds. Seabirds both in flight and resting on the water's surface would be vulnerable to an ordnance strike. Seabirds exposed to an ordnance strike would suffer sublethal injury or mortality. However, the vast area over

which training activities occur and implementation of Navy resource protection measures, combined with the small size and ability of birds to flee disturbance, would make direct strikes unlikely. Individual birds may be affected, but ordnance strikes have no effect on species or community populations. Ordnance strikes under the No Action Alternative will not have a significant adverse effect on migratory bird populations. Furthermore, in accordance with EO 12114, harm to seabirds from ordnance strikes in waters beyond the U.S. territorial sea is improbable. Ordnance strikes under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabirds.

Direct ordnance strikes from firing weapons are potential, but very unlikely, threats to short-tailed albatross. Based on a TMAA size of 42,146 nm^2 (144,557 km^2) and assuming distribution of activities within 20 percent of the TMAA (8,429 nm^2 [28,911 km^2]), 1.86 items per nm^2 per year (0.5 kg per km^2) would be used in within the TMAA. However, the potential for a direct bird strike by ordnance would remain quite low. Effects could include disturbance and relocation, sub-lethal injury, and mortality. However, the vast area of 42,146 nm^2 (145,482 km^2) over which training activities could occur and combined with the small size of the birds and the ability of the birds to flee, would make direct strikes unlikely. Additionally, Navy guidance indicates that activities involving explosions must have a cleared buffer area of 600 yards around the detonation area before the activity can be conducted (See Mitigation, Section 3.9.3) further reduces the possibility of a direct ordnance strike. In accordance with the ESA, ordnance and ordnance-related materials under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabirds.

Explosive Ordnance (At-Sea Explosions)

Under the No Action Alternative, activities involving explosions and impacts occur at or just below the surface in the TMAA. These explosions missiles and bombs used during Bombing Exercises (BOMBEX); and high-explosive shells fired during Gunnery Exercises (GUNEX) and BOMBEX. Missiles used in air-to-air training events at sea (MISSLEX), although part of live fire events, are designed to detonate in the air (typically above 15,000 feet where expected bird density is low) and do not constitute an at-sea explosion occurring in water as analyzed in this document. Birds in the immediate vicinity and exposed to explosions and impacts could suffer temporary effects, and these effects would be in proportion to the proximity to the explosion and size of the detonation. Birds that may be present in proximity to these activities could be disturbed and relocate, or they could be injured or killed (NMFS 2002). Based on a TMAA size of 42,146 nm^2 (144,557 km^2) and assuming distribution of activities within 20 percent of the TMAA (8,429 nm^2 [28,911 km^2]), 0.01 explosions per nm^2 per year (0.003 per km^2) could occur in within the TMAA. This usage would produce a very low density of offshore detonations per year within the TMAA. This, coupled with Navy resource protection measures implemented prior to these activities (Section 3.9.3) would provide a high level of protection for the birds during these exercises, making the potential for effects quite low.

At-sea explosions under the No Action Alternative would not adversely affect migratory bird populations and their habitat. In accordance with EO 12114, minimal harm to birds from at-sea explosions in nonterritorial seas (beyond 12 nm [22 km]) would occur.

Direct impacts from at-sea explosions are possible, but are unlikely threats to short-tailed albatross. Explosions have the potential to affect the short-tailed albatross only if the bird is in the immediate vicinity above the explosion. Impacts would be possible, but have a low potential for occurrence given the large area of the TMAA, limited use of live ordnance, and implementation of Navy protective measures. In accordance with the ESA, at-sea explosions under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabirds.

Expended Materials

The Navy expends a variety of materials during training exercises in the TMAA. The types and quantities of expended materials used, and information regarding fate and transport of these materials within the marine environment, are discussed in Section 3.2 (Expended Materials) and Section 3.3 (Water Resources).

The effect of materials expended during training in the TMAA is assessed by the number of expended items per unit area. Under the No Action Alternative, an estimated 15,982 items would be expended in this area (Table 3.9-2). Based on a TMAA size of 42,146 nm^2 (144,557 km^2) and assuming distribution of activities within 20 percent of the TMAA (8,429 nm^2 [28,911 km^2]), 1.9 items per nm^2 per year (0.5 kg per km^2) would be deposited in the ocean. More than 97 percent of these items would be from gunshells and small caliber rounds.

Table 3.9-2: Expended Training Materials in the TMAA – All Alternatives

Training Material	No Action Alternative	Alternative 1		Alternative 2	
	Number	Number	% Increase from No Action	Number	% Increase from No Action
Bombs	120	180	50	360	200
Missiles	22	33	50	66	200
Naval Gunshells	10,564	13,188	25	26,376	150
Small Caliber Rounds	5,000	5,700	14	11,400	128
Sonobuoys	24	793	3,200	1,587	6,500
Targets & Pyrotechnics	252	322	28	644	160
PUTR	0	7	N/A	7	N/A
SINKEX	0	0	N/A	858	N/A
Total	**15,982**	**20,223**	**26**	**41,298**	**160**

Expended materials resulting from ordnance use include remnants and shrapnel from explosive rounds and nonexplosive training rounds. These solid materials, many of which have a high metal content, quickly drop through the water column to the sea floor. Ingestion of expended ordnance does not occur in the water column because ordnance-related materials quickly sink.

The probability of birds ingesting expended ordnance depends on factors such as the location of the spent material, size of the material, likelihood the material would be mistaken for prey, and extent of benthic foraging that occurs in the impact area. Some materials, such as nonexplosive training bombs, would be too large to be ingested by a bird, but other materials, such as small-caliber ammunition and shrapnel, are small enough to be swallowed. Marine debris can pass through the digestive tract and be voided naturally without causing harm, or it can cause sublethal or lethal effects. Sublethal effects include nutrient dilution, which occurs when nonnutritive debris displaces nutritious food in the gut, leading to slow growth or reduced reproductive success (McCauley and Bjorndal 1999). While ingestion of marine debris has been linked to bird mortalities, sublethal effects are more common (Bjorndal et al 1994, Tomas 2002, McCauley and Bjorndal 1999). It is possible that persistent expended ordnance could be colonized by benthic organisms (such as clams and oysters) and then mistaken by birds for prey, or that expended ordnance could be accidentally ingested by birds while they were foraging for natural prey items. As foraging depths of diving birds is restricted to shallow depths, it is highly unlikely that benthic foraging by birds would occur in areas of ordnance use, or that ingestion of expended ordnance would affect birds. Most benthic foraging by birds occurs in nearshore areas (Lutcavage et al. 1997). All ordnance use in the

TMAA would occur in areas beyond 12 nm (22 km) from shore where water depths in excess of 3,000 ft would exclude benthic foraging.

Ordnance-related materials under the No Action Alternative would not adversely affect migratory bird populations and their habitat. In accordance with EO 12114, harm to birds from ordnance-related materials would be unlikely in waters beyond the U.S. territorial sea.

Additional materials expended during training include illuminating flares, chaff, and marine markers. These materials are dismissed from further analysis because, for both canisters and markers, the majority of the constituents are consumed by heat and smoke, both of which dissipate in the air. MK-58 marine markers produce chemical flames and surface smoke and are used in training exercises to mark an ocean surface position to simulate divers, ships, and points of contact. The smoke dissipates in the air and has little or no effect on birds. The marker burns similarly to a flare, producing a flame until all combustible components have been consumed. Any remaining materials from marine markers would sink into bottom sediments or become encrusted by chemical processes or by marine animals. Phosphorus contained in the markers reacts with seawater to produce phosphoric acid, a variable, but normal, component of seawater.

Chaff is a thin polymer with an aluminum coating that is cut in various lengths to affect and block various radar frequencies. All of the components of the aluminum coating are present in seawater in trace amounts, except magnesium, which is present at 0.1 percent. The stearic acid coating is biodegradable and nontoxic. The fibers are too short and fine to pose an entanglement risk. Although they potentially could be ingested by marine life, the fibers are non-toxic. Chemicals leached from the chaff would be diluted by the surrounding seawater to levels below those that can affect sediment quality and benthic habitats. In accordance with the ESA, military expended materials under the No Action Alternative may affect, but are not likely to adversely affect, ESA-listed seabirds.

Target-Related Materials

A variety of at-sea targets are used in the TMAA, ranging from high-technology, remotely operated airborne and surface targets (such as airborne drones) to low-technology, floating, at-sea targets (such as inflatable targets) and airborne, towed banners. Many of the targets are designed to be recovered for reuse and are not destroyed during training. The expendable targets used in the TMAA include the BQM-74E Tactical Air Launched Decoy (TALD), floating targets, and MK-58 marine marker. These units are 2 and 3 ft (0.6 and 0.9 m) in length, respectively, sink to the bottom intact, and present no ingestion hazard to birds.

The TALD is an air launched, preprogrammed, unpowered vehicle used to deceive and saturate enemy integrated air defenses during strike aircraft operations. It is approximately 7.5 ft (2.3 m) long, with a wing span of 5 ft (1.5 m). It operates as an expendable vehicle with no recovery capabilities. Under the No Action Alternative, eight TALDs would be used annually. Based on the large size of the TMAA, low number of TALDs used, and abilities of birds to readily disperse from disturbance, it is very unlikely that birds would be measurably affected by use of TALDS.

Floating targets, such as naval gunnery target balloons (known as Killer Tomatoes) are required and utilized by Navy units to maintain a state of readiness in target acquisition and gunnery skills. Surface targets are made from urethane fabric, are relatively lightweight, easily stored, inflated, and deployed by just a few personnel. Most target balloons are radar enhanced with reflective metal foil material intended to simulate a small-craft on electronic systems. This allows radar system operators to lock onto their target to ascertain range and azimuth information for use by commanders to initiate simulated combat, interdiction, or rescue missions. Though the naval gunnery target balloons are attempted to be recovered after training activities, a destroyed floating target could fill with water and sink to the bottom of the water column. Combined with the low number of floating targets that could sink in this manner, the large

area of the TMAA, and the depth of the expended target after completing the exercise, it is very unlikely that birds would be measurably affected by use of floating targets.

Target use under the No Action Alternative would not adversely affect migratory bird populations and their habitat. In accordance with EO 12114, harm to birds from targets and marine markers would be unlikely in nonterritorial seas.

Target use under the No Action Alternative is an unlikely threat to short-tailed albatross. The expendable targets used in the TMAA quickly sink to the bottom, and present little to no ingestion hazard to short-tailed albatross. Impacts would be possible, but have a low potential for occurrence due to the large area of the TMAA and low numbers of targets used. Target use in nonterritorial seas under the No Action Alternative may affect, but is unlikely to adversely affect, ESA-listed seabirds.

Entanglement

Expended material such as parachutes from sonobouys, associated parachute lines, or shrouds may be encountered by birds in the waters of the TMAA. Entanglement in persistent marine debris causes mortality in birds in the eastern Pacific Ocean. Birds that become entangled could drown, starve to death, lose a limb, or attract predators with their struggling (Melvin and Parrish 2001). There is a potential for birds to become entangled in expended materials that are on or near the surface. Materials that are expended in training activities, including sonobuoys and markers, usually sink shortly after they are deployed. As a result, the potential for entanglement in these materials is low.

Under the No Action Alternative, approximately 24 parachutes associated with sonobuoys are deployed and not recovered. These parachutes deliver sonobuoys during training activities in the TMAA. Given the infrequent occurrence of birds in the study area and the low concentration of entanglement hazards, the potential for bird entanglement in military expended material would be low. Entanglement hazards under the No Action Alternative would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from military expended material would be unlikely in nonterritorial seas.

Similar to target use, parachute lines or shrouds sink shortly after being deployed. Given the low density of short-tailed albatross in the TMAA and the low concentration of entanglement hazards, the potential for short-tailed albatross entanglement in Navy expended material is low. In accordance with the ESA, expended material under the No Action Alternative may affect, but is not likely to adversely affect, ESA-listed seabirds.

Threatened and Endangered Species

Within the TMAA, the single endangered species is the short-tailed albatross. As part of the EIS/OEIS process the Navy entered into consultation with the appropriate federal and state agencies. Utilizing criteria and analysis methodology as presented for non-listed species, vessel movements, aircraft overflight, ordnance use, explosions, and military expended materials (entanglement) may affect, but are not likely to adversely affect individual or populations of short-tailed albatross under the No Action Alternative in the TMAA. The USFWS signed a letter indicating concurrence with this position on 24 March 2010 (see correspondence in Appendix C).

Migratory Bird Treaty Act

All activities that would take place under the No Action Alternative fall within the MBTA definition of military readiness activities. The take of an individual bird from these activities is allowed under the MBTA provided it does not result in a significant adverse effect on a population of a migratory bird species. The activities associated with the No Action Alternative would not diminish the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function

effectively in its native ecosystem, nor would it adversely affect migratory bird populations. As a result and in accordance with 50 C.F.R. Part 21, the Navy is not required to confer with the USFWS on the development and implementation of conservation measures to minimize or mitigate adverse effects to migratory birds that are not listed under the ESA.

3.9.2.5 Alternative 1

Under Alternative 1, the general level of some activities in the TMAA would increase relative to those under the No Action Alternative. In addition, training activities associated with force structure changes would be implemented for the EA-18G Growler, SSGN, P-8 MMA, DDG 1000, and UASs. Force structure changes associated with new weapons systems associated with new training instrumentation include the PUTR. Birds would have the potential to be affected by vessel movements, aircraft overflights, weapons firing / non-explosive ordnance use, explosive ordnance, and expended materials under Alternative 1.

Vessel Movements

As discussed for the No Action Alternative, the number of Navy vessels operating during training activities varies, but generally includes up to 27 surface ships and one submarine (collectively referred to as vessels). Vessel movements would be widely dispersed throughout the area. Under Alternative 1, steaming hours would increase from current conditions. The small increase in steaming hours would not measurably increase potential effects to birds from disturbance or vessel collision. Impacts would be the same as those described for the No Action Alternative.

Vessel movements under Alternative 1 would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from vessel movements in nonterritorial seas would be unlikely. In accordance with the ESA, vessel movements in nonterritorial seas under Alternative 1 may affect but are unlikely to adversely affect ESA-listed seabirds.

Aircraft Overflights

As discussed for the No Action Alternative, most flights under Alternative 1 would occur over marine environments, at elevations in excess of 3,000 ft (914 m), and beyond 12 nm (22 km). Most sound exposure levels would be lower than 97 A-weighted decibels (dBA) because a majority of the overflights would occur above 15,000 ft (4,752 m). Overflights occurring between the TMAA and inland operating areas occur at altitudes above 15,000 ft, well above those flight levels that would cause exposure to sound. Impacts to birds from aircraft disturbance would be the same as those described for the No Action Alternative. Under Alternative 1, aircraft overflight noise would elicit brief behavioral responses in exposed birds, but the general health of individual birds would not be compromised.

As discussed for the No Action Alternative, relatively few vessel-based Navy aircraft strike birds each year. The potential for bird strikes to occur offshore is low because activities are widely dispersed and at altitudes above 15,000 ft (914 m) where bird densities are low. Overflights occurring between the TMAA and inland operating areas occur at altitudes above 15,000 ft (4,752 m), where bird densities are much lower than those at lower altitudes. The proposed increase in aircraft overflights would not measurably change impacts from those described for the No Action Alternative. Few, if any, birds would be struck by vessel-based Navy aircraft under Alternative 1.

Aircraft overflights under Alternative 1 would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from aircraft overflights in nonterritorial seas is possible, but would be unlikely. Aircraft overflights in nonterritorial seas under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Weapons Firing/Nonexplosive Practice Ordnance

As described for the No Action Alternative, the potential for birds to be struck by ordnance is low, given the patchy distribution of birds, ability of birds to flee from disturbance, and low concentration of dispersed rounds. Individual birds may be affected, but ordnance strikes would have no effect on species or community populations. Avoidance measures are implemented prior to and during these activities to minimize impacts to birds (see Section 3.9.3 and Chapter 5, Mitigation). In accordance with the ESA, weapons firing or nonexplosive ordnance use in waters beyond the U.S. territorial sea under Alternative 1 may affect, but is unlikely to adversely affect, ESA-listed seabirds.

Explosive Ordnance (At-Sea Explosions)

Under Alternative 1, explosions from missiles and bombs used during BOMBEX and MISSILEX; and shells fired during GUNEX and BOMBEX would increase. As mentioned previously, missiles used in air to air training events at sea (MISSLEX), although part of a live fire event, are designed to detonate in the air (typically above 15,000 ft (4,752 m) where expected bird density is low) and do not constitute an at-sea explosion occurring in water as analyzed in this document. In addition, there would also be subsurface explosions that involve the use of explosive sonobuoys used during a Tracking Exercise (TRACKEX). Birds in relatively close proximity to these activities could be disturbed and relocate, or be injured or killed. Based on a TMAA size of 42,146 nm^2 (144,557 km^2) and assuming distribution of GUNEX and BOMBEX activities within 20 percent of the TMAA (8,429 nm^2 [28,911 km^2]), 0.015 explosions per nm^2 per year (0.004 per km^2) would occur in within the TMAA. Although the potential for birds to be injured by explosions exists, the chance of this occurrence is low. Navy avoidance measures (see Section 3.9.3) implemented prior to explosive activities would provide a high level of protection for birds during at-sea explosions.

Under Alternative 1, explosions and impacts would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from at-sea explosions in nonterritorial seas would be unlikely. In accordance with the ESA, explosions in nonterritorial seas under Alternative 1 may affect, but is unlikely to adversely affect, ESA-listed seabirds.

Expended Materials

Under Alternative 1, an estimated 20,223 items would be expended in the TMAA, a 26 percent increase over the No Action Alternative (see Table 3.9-2). Based on an open ocean area of 42,146 nm^2 (144,557 km^2) and assuming a distribution of activities over 20 percent of this area, 2.4 items per nm^2 per year (0.7 kg per km^2) would be deposited in the ocean. More than 93 percent of these expended items would be gunshells and small caliber rounds that sink through the water column quickly. It is highly unlikely that benthic foraging by birds occurs in the area where ordnance would be found. All ordnance use in the TMAA would occur in areas more than 3 nm offshore where water depths are in excess of 3,000 ft (914 m). Under Alternative 1, ingestion of military expended materials may affect, but is not likely to adversely affect, ESA-listed seabirds.

As indicated in Table 3.9-2, use of targets and pyrotechnics would increase by 28 percent under Alternative 1 from 252 to a total of 322 targets. As discussed for the No Action Alternative, the expendable targets used in the TMAA are the Expendable Mobile Anti-Submarine Warfare (ASW) Training Target (EMATT), floating targets, and TALD. An EMATT is a small device (approximately 2 ft in length and 3 inches in diameter) shaped like a torpedo that can be launched by hand from a surface vessel or deployed from a submarine or aircraft. EMATTs are programmed to move through the water and provide acoustic and other sensor that mimic a submarine. At the end of its use, an EMATT will sink to the floor of the ocean. Expended EMATTs are unlikely to result in any physical impacts to the sea floor. Expended EMATTs would sink into a soft bottom or would lie on a hard bottom, where they may provide a substrate for benthic colonization and may be covered eventually by shifting sediments. All

EMATTs used in the TMAA would occur in areas beyond 12 nm (22 km) from shore where water depths in excess of 3,000 ft (914 m) would exclude benthic foraging on materials resting on the bottom following exercises. The modest change in use of these materials and the inclusion of EMATTs would not measurably change the impacts to birds over existing conditions. Thus, effects would be the same as those described for the No Action Alternative.

Under Alternative 1, approximately 793 parachutes associated with sonobuoys would be deployed and not recovered. Assuming a distribution of hazards covering only 20 percent of the TMAA, the concentration of entanglement hazards would be 0.09 per nm^2. As described for the No Action Alternative, given the infrequent occurrence of birds in the TMAA and the low concentration of entanglement hazards, the potential for bird entanglement in military expended material would be low.

Expended materials under the Alternative 1 would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from expended materials in nonterritorial seas would be unlikely. In accordance with the ESA, military expended materials in nonterritorial seas under Alternative 1 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Threatened and Endangered Species

Within the TMAA, the single endangered species is the short-tailed albatross. As part of the EIS/OEIS process the Navy entered into consultation with the appropriate federal and state agencies. Utilizing criteria and analysis methodology as presented for nonlisted species, vessel movements, aircraft overflight, ordnance use, explosions, and military expended materials (entanglement) may affect, but are unlikely to adversely affect, individual short-tailed albatross under Alternative 1 in the TMAA. The USFWS signed a letter indicating concurrence with this position on 24 March 2010 (see correspondence in Appendix C).

Migratory Bird Treaty Act

All activities that would take place under Alternative 1 fall within the MBTA definition of military readiness activities. The take of an individual bird from these activities is allowed under the MBTA provided it does not result in a significant adverse effect on a population of a migratory bird species. The activities associated with Alternative 1 would not diminish the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem, nor would it adversely affect migratory bird populations. As a result and in accordance with 50 C.F.R. Part 21, the Navy is not required to confer with the USFWS on the development and implementation of conservation measures to minimize or mitigate adverse effects to migratory birds that are not listed under the ESA.

3.9.2.6 Alternative 2

Implementation of Alternative 2 would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional separate summertime CSG exercise lasting up to 21 days within the ATA.
- Conduct a SINKEX in each summertime exercise (a maximum of two) in the TMAA.

Birds would have the potential to be affected by vessel movements, aircraft overflights, sonar, weapons firing/nonexplosive ordnance use, explosive ordnance, and expended materials under Alternative 2.

Vessel Movements

Under Alternative 2, there may be up to 30 surface vessels and 1 submarine participating in training activities during two distinct training periods. Under Alternative 2, steaming hours would increase from current conditions, although the increase in steaming hours would not measurably increase potential effects to birds. Disturbance impacts to birds from vessel movements under Alternative 2 would be the same as those described for the No Action Alternative.

Vessel movements under Alternative 2 would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from vessel movements in nonterritorial seas would be unlikely. In accordance with the ESA, vessel movements in nonterritorial seas under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Aircraft Overflights

As discussed in the analyses for the No Action Alternative and Alternative 1, bird responses to noise from aircraft overflights would be limited to brief behavioral or physiological reactions and the general health of individual birds would not be compromised. The increase in potential exposure to visual and sound disturbance would not measurably increase effects to birds. Aircraft noise effects of Alternative 2 would be the same as the described for the other alternatives.

As described for the No Action Alternative and Alternative 1, the potential for bird strikes to occur in offshore areas is relatively low because activities are widely dispersed and at relatively high altitudes where bird densities are low. Few, if any, aircraft strikes are expected to occur in the TMAA. The potential for bird strikes to occur between the TMAA and inshore areas is much lower than those for offshore areas, as the bird densities at the altitudes of these overflights (above 15,000 ft) is extremely low.

Aircraft overflights under Alternative 2 would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from aircraft overflights in nonterritorial seas would be unlikely. In accordance with the ESA, aircraft overflights in nonterritorial seas under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Weapons Firing / Nonexplosive Ordnance Use

As described for the other alternatives, birds could be vulnerable to a direct ordnance strike. However, the potential for birds to experience strike would remain quite low. Avoidance measures are implemented prior to and during these activities to minimize impacts to birds (see Section 3.9.3). The large area over which ordnance is used, small size of the birds, and ability of birds to readily flee would make direct strikes unlikely. Individual birds may be affected, but ordnance strikes would have no effect on species or community populations.

Ordnance strikes under Alternative 2 would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from ordnance use in waters beyond the U.S. territorial sea would not be likely. In accordance with the ESA, ordnance use in nonterritorial seas under Alternative 2 may affect, but is not likely to adversely affect, ESA-listed seabirds.

Explosive Ordnance (At-Sea Explosions)

Under Alternative 2, explosions and impacts would occur either at the water's surface, or underwater at depth. Birds in relatively close proximity to these activities could be disturbed and relocate, or be injured or killed. However, the rate of occurrence of these effects would be quite low. Based on a TMAA size of 42,146 nm^2 (144,557 km^2) and assuming distribution of GUNEX and BOMBEX activities within 20 percent of the TMAA (8,429 nm^2 [28,911 km^2]), 0.02 explosion per nm^2 per year (0.006 per km^2) would

occur in the TMAA. Navy avoidance measures (see Section 3.9.3 and Chapter 5, Mitigation) implemented prior to explosive activities would provide a high level of protection for birds during at-sea explosions, and the likelihood of birds being affected is expected to be quite low.

Birds exposed to explosions could suffer temporary effects, sublethal injury or mortality (Yelverton et al. 1973, Yelverton 1981). Although the potential for birds to be injured by explosions exists, the chance of this occurrence is low. At-sea explosions under Alternative 2 would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from at-sea explosions in nonterritorial seas would be unlikely. In accordance with the ESA, at-sea explosions in nonterritorial seas under Alternative 2 may affect, but are not likely to adversely affect ESA-listed seabirds.

Sinkex

Under Alternative 2, additional explosions would occur in the Study Area associated with two sinking exercises (SINKEX) that use explosive ordnance. In a SINKEX, weapons are typically fired in order of decreasing range from the source with weapons fired until the target is sunk. For each SINKEX, up to 14 missiles, 14 bombs, 400 gunnery rounds, and 1 torpedo are utilized during SINKEX activities.

More than 93 percent of these items would be gunnery (5-inch) rounds. As described for other activities involving ordnance, individual birds may be affected, but ordnance strikes would have no effect on species or community populations. Birds exposed to underwater explosions would suffer temporary effects, sub-lethal or lethal injuries, or direct mortality, in proportion to the proximity to the explosion and size of the detonation. Avoidance measures are implemented prior to and during these activities to minimize impacts to birds (see Section 3.9.3 and Chapter 5). Typical areas where large numbers of birds congregate are located in nearshore and intertidal areas. Offshore explosives use in the TMAA is a considerable distance from areas where most birds would be expected, therefore impacts to birds from offshore explosions are possible, but have a low potential for occurrence.

Under Alternative 2, ordnance use and explosions associated with SINKEX would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from at-sea ordnance use and explosions in nonterritorial seas would be unlikely.

Direct impacts from explosions associated with SINKEX activities are possible, but are unlikely threats to short-tailed albatross. Explosions have the potential to affect the short-tailed albatross only if the bird is in the immediate vicinity above the explosion. Effects would depend on the distance from the detonation and size of the explosion and would include disturbance and relocation, temporary effects, sub-lethal injuries, or direct mortality. Impacts would be possible, but have a low potential for occurrence given the use of live ordnance is limited. In accordance with the ESA, ordnance use and explosions in nonterritorial seas associated with SINKEX under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Expended Materials

Under Alternative 2, an estimated 41,298 items would be expended in the TMAA, a 160 percent increase over the No Action Alternative (Table 3.9-2). Based on an open ocean area of 42,146 nm^2 (144,557 km^2) and assuming distribution of activities over 20 percent of the TMAA, 4.9 items per nm^2 per year (1.4 kg per km^2) would be deposited in the ocean. As described for the other alternatives, all ordnance use would occur in areas beyond 12 nm (22 km) from shore where water depths in excess of 3,000 ft (914 m), excluding seabird benthic foraging. Although a small potential for expended materials to be ingested by birds may exist, the low concentration of expended rounds and the great depth to benthic habitats in the TMAA would make this occurrence highly unlikely.

Under Alternative 2, 644 target related materials would potentially be expended in the TMAA. As described for the other alternatives, many of the targets are designed to be recovered for reuse, but the EMATT, and TALD would be expended. Based on the large size of the TMAA, low number of targets used, and abilities of birds to readily disperse from disturbance, it is not likely that birds would be measurably affected by use of at-sea targets.

Under Alternative 2, approximately 1,587 parachutes associated with sonobuoys would be deployed with at-sea targets and marine markers in offshore areas and not recovered. Assuming a distribution of activities over 20 percent of the TMAA, the concentration of these expended parachutes which represent an entanglement hazard would be 0.18 per nm^2. Given this low concentration, the potential for bird entanglement in military expended material would be low. Under Alternative 2, birds may be affected by entanglement in military expended material, but the effects would be small because of the infrequent occurrence of birds and low concentration of military expended material.

Expended materials would not adversely affect migratory bird populations. In accordance with EO 12114, harm to birds from expended materials in nonterritorial seas would be possible, but unlikely. In accordance with the ESA, expended materials in nonterritorial seas under Alternative 2 may affect, but are not likely to adversely affect, ESA-listed seabirds.

Threatened and Endangered Species

Within the TMAA, the single endangered species is the short-tailed albatross. As part of the EIS/OEIS process, the Navy entered into consultation with the appropriate federal and state agencies. Utilizing criteria and analysis methodology as presented for nonlisted species, vessel movements, aircraft overflight, ordnance use, explosions, and military expended materials (entanglement) may affect individual short-tailed albatross under Alternative 2 in the TMAA. The USFWS signed a letter indicating concurrence with this position on 24 March 2010 (see correspondence in Appendix C).

Migratory Bird Treaty Act

All activities that would take place under Alternative 2 fall within the MBTA definition of military readiness activities. The take of an individual bird from these activities is allowed under the MBTA provided it does not result in a significant adverse effect on a population of a migratory bird species. The activities associated with Alternative 2 would not diminish the capacity of a population of a migratory bird species to maintain genetic diversity, to reproduce, and to function effectively in its native ecosystem, nor would it adversely affect migratory bird populations. As a result and in accordance with 50 C.F.R. Part 21, the Navy is not required to confer with the USFWS on the development and implementation of conservation measures to minimize or mitigate adverse effects to migratory birds that are not listed under the ESA.

3.9.3 Mitigation

As summarized in Section 3.9.4, the actions proposed in this EIS/OEIS could affect some individual birds within the TMAA, but community- or population-level effects would not be expected under any of the alternatives. Current mitigation measures include:

- Guidance involving explosions contains instructions to personnel to observe the surrounding area within 600 yards for 30 minutes prior to detonation. If diving birds (or marine mammals or sea turtles) are seen, the activity must be relocated to an unoccupied area or postponed until animals leave the area.

Current protective measures would continue to be implemented by the Navy, and no additional mitigation measures would be needed to protect birds or their habitats.

3.9.4 Summary of Effects

The Alaska Training Area (ATA) encompasses important foraging habitats for birds. Migratory birds utilize the productive offshore waters associated with the Pacific coast upwelling to forage during wintering and migratory movements. Coastal developments, loss of habitat, commercial fishing, and introduced species have caused populations of many seabird species to decline in recent decades. Navy activities in the TMAA however, would not be expected to increase effects to bird populations. Based on the analysis of the proposed alternatives, it is thought that impacts to individual protected and migratory birds could occur, but the number of individual birds affected would be low and poses minimal impact potential to seabird populations. Table 3.9-3 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on birds under both NEPA and EO 12114.

Under the No Action Alternative, Alternative 1, or Alternative 2 (Preferred Alternative) at the TMAA, vessel movements, aircraft overflight, ordnance use, at-sea explosions, and military expended materials (entanglement) may affect, but not likely to adversely affect, individual short-tailed albatross.

Table 3.9-3: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Due to flight altitude, behavioral responses to overflights in territorial seas are not expected. • Potential for harm to birds from aircraft strikes is extremely low and is not anticipated.	• Harm due to vessel movements is unlikely. • Brief behavioral response to overflights.. Low potential for harm to birds from aircraft strikes. • Low potential for harm to birds from ordnance use. • Low potential for harm to birds from explosives use. • Low potential for harm from military expended materials. • Within the TMAA, the single endangered species is the short-tailed albatross. Vessel movements, aircraft overflight, ordnance use, at-sea explosions, and military expended materials (entanglement) may affect, but are not likely to adversely affect individual ESA-listed seabirds.
Alternative 1	• Due to flight altitude, behavioral responses to overflights in territorial seas are not expected. • Potential for harm to birds from aircraft strikes is extremely low and is not anticipated.	• Harm due to vessel movements is unlikely. • Brief behavioral response to overflights. Low potential for harm to birds from aircraft strikes. • Low potential for harm to birds from ordnance use. • Low potential for harm to birds from explosives use. • Low potential for harm from military expended materials. • No considerable harm to birds, migratory birds, bald eagles, or their habitat. • Within the TMAA, the single endangered species is the short-tailed albatross. Vessel movements, aircraft overflight, ordnance use, at-sea explosions, and military expended materials may affect, but not likely to adversely affect individual ESA-listed seabirds.

Table 3.9-3: Summary of Effects by Alternative (continued)

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 2 (Preferred Alternative)	• Due to flight altitude, behavioral responses to overflights in territorial seas are not expected. • Potential for harm to birds from aircraft strikes is extremely low and is not anticipated.	• Harm due to vessel movements is unlikely. • Brief behavioral response to overflights. Low potential for harm to birds from aircraft strikes. • Low potential for harm to birds from ordnance use. • Low potential for harm to birds from explosions and impacts. • Low potential for harm from military expended materials. • No considerable harm to birds, migratory birds, bald eagles, or their habitat. • Within the TMAA, the single endangered species is the short-tailed albatross. Vessel movements, aircraft overflight, ordnance use, at-sea explosions, and military expended materials may affect, but not likely to adversely affect individual ESA-listed seabirds.

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3.10 Cultural Resources

3.10 CULTURAL RESOURCES

The term "cultural resources" includes prehistoric and historic sites, structures, objects, landscapes, ethnographic resources, and other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources are divided into four groups: archaeological resources (both historic and prehistoric terrestrial and nearshore sites), architectural resources, traditional cultural resources, and underwater (submerged) resources. The focus on this analysis is on submerged resources which are sites that may, or may not, have cultural affiliation. Submerged resources in the Alaska Region may include prehistoric and/or historic coastal migration and settlement sites, shipwrecks, airplanes, or pieces of ship components, such as cannons or guns.

3.10.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for cultural resources includes the Temporary Maritime Activities Area (TMAA). Aircraft overflights above 15,000 ft will take place between the shore and the TMAA; however, this activity will have no impact on cultural resources given the altitude of these flights. This area from shore to the TMAA is not considered further in this analysis of potential impact on cultural resources. Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.10.1.1 Existing Conditions

The Alaska Region is an enormous (one fifth the size of the continental United States) and diverse ecological, physiological, and cultural area. A complete discussion of what is known of the prehistory and history of the Alaska Region would be inappropriate for this document; however, a general description of cultural resources within the area is provided below.

More than 10,000 years ago, the Alaska mainland was, physically and ecologically, a part of Asia, from which it was severed by the rising seawater that formed the Bering Sea to the south and the Chukchi Sea to the north. The Bering Strait is the connection between the two seas. Alaska's importance to American prehistory is the result of its unique geographic position; not just for the early settlement of the continent but also as the area through which later waves of immigration passed (U.S. Department of the Interior [USDOI], National Park Service [NPS] 2004).

At the height of the Pleistocene Epoch (approximately 11,500 years ago), the Alaskan interior formed a relatively ice-free bowl, covered by "steppe tundra" vegetation (also called mammoth tundra), out of which a narrow, ice-free corridor led eastward and southward into the continental interior. There may have also been an ice-free zone along coastal zones into the Pacific Northwest; however, most of those areas are now submerged due to rising sea levels and there is no definitive evidence confirming this migration route. At the time of European contact (18th century), inhabitants of the Alaska coast existed by open-water hunting and fishing; the Alaskan interior was home to broadly adapted hunters and fishers of the boreal forest (USDOI, NPS 2004).

Archaeological evidence from Alaska reveals a wide range of archaeological site types. Among the most important are those that date from the late Pleistocene and early Holocene (approximately 15,000 to 8,000 years before the present). These sites (known as Paleoarctic or Paleoindian sites) provide a record of the first entries of humans into the Americas and are consequently associated with a significant migratory

event- the peopling of the New World. Descendants of the "First Alaskans" eventually migrated across both North and South America (USDOI, NPS 2004).

Underwater Cultural Resources

Powerful currents, gales, treacherous seas, and mechanical reasons have been responsible for the numerous shipwrecks off the Alaska coast. There are thousands of shipwrecks within the GOA, the earliest of which date to the 18th century. The location (on the bottom) for all but a few of these shipwrecks is unknown or only roughly approximate. The highest density of shipwrecks occurs within 50 nautical miles (nm) (92.6 kilometers [km]) of the Alaska coastline and most rest at depths of between 656 feet (ft) (200 meters [m]) and 3,280 ft (1,000 m). Among the many types of wrecks represented are schooners, brigs, trawlers and other fishing vessels, cargo ships, barges, icebreakers, ferries, tug boats, cruise ships, freighters, and pleasure boats (USDOI Minerals Management Service, Alaska OCS Region 2008).

A comprehensive shipwreck database is maintained by the Department of the Interior, Minerals Management Service, Alaska OCS Region and this database serves as the definitive record for shipwrecks in the region. Based on this database, nine shipwrecks are believed to potentially be within the TMAA (Figure 3.10-1). Given the age of some of the wrecks and the types of historical records used to identify their locations, precise longitudes/latitudes are not always possible; however, the information provided in the database is the most accurate locational data available based on the wreck descriptions (Burwell 2008a). The oldest of the shipwrecks potentially within the TMAA dates to 1786 (the *Sea Otter*, a British sloop) (Table 3.10-1). Three of the shipwrecks are modern (sank between 1990 and 1992) and none of the nine shipwrecks has been determined eligible for inclusion in the National Register of Historic Places (NRHP). The closest known NRHP-eligible shipwreck is the *S.S. Aleutian* in Uyak Bay, which is situated on the north side of Kodiak Island, approximately 75 miles (mi) (120 km) from the TMAA (Burwell 2008b).

3.10.1.2 Current Requirements and Practices

The Navy has established protective measures to reduce potential effects on cultural and natural resources from training exercises in coastal waters and for land and sea ranges. Some are generally applicable, while others apply to particular geographic areas or during specific times of year. Protective measures in other locations include avoidance of known shipwreck sites or the use of inert ordnance. Precise and accurate locations for shipwrecks in the TMAA are not known. Inadvertent discovery of a shipwreck would cause training potentially impacting the resource to halt until federal authorities (e.g., Navy Federal Preservation Officer; Alaska State Historic Preservation Officer [SHPO]) are notified to determine the appropriate actions.

3.10.2 Environmental Consequences

As noted in Section 3.10.1, the ROI for cultural resources includes the TMAA. Navy training activities that occur within the Air Force inland Special Use Airspace and the Army inland training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) are analyzed in this EIS/OEIS pursuant to Executive Order (EO) 12114.

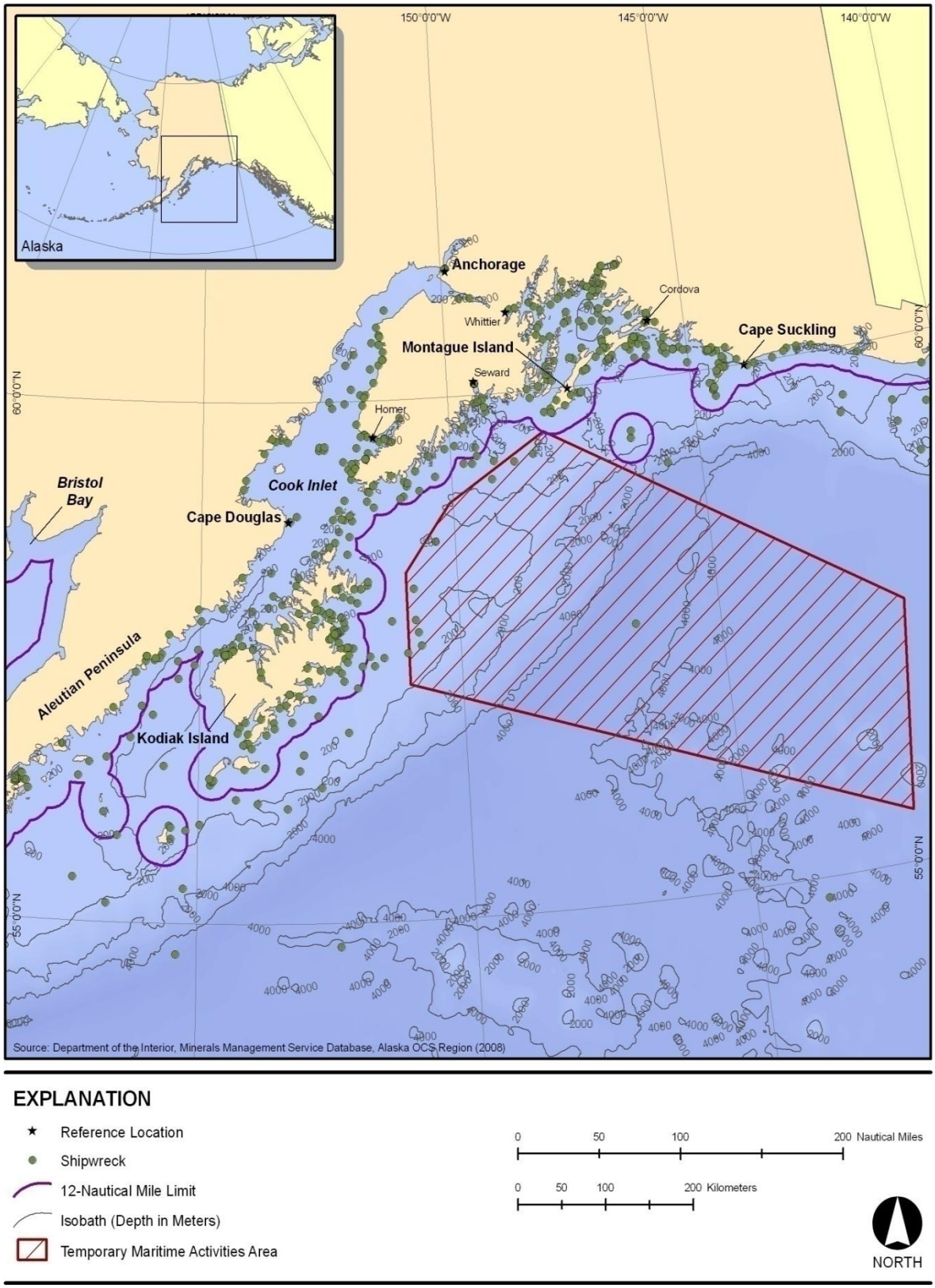


Figure 3.10-1: Shipwrecks in and around the Gulf of Alaska

Table 3.10-1: Shipwrecks that May be Located within the TMAA

Vessel ID #	Vessel Name	Vessel Type	Date Lost	Cause of Loss
609	*Mary Wood*	Schooner	Jan 18, 1894	Stranded
851	*Sea Otter*	British Sloop	Sep 1, 1786	Carrying a cargo of furs, this vessel was met at Prince William Sound by the vessels *Captain Cook* and *Experiment*. It was believed to have floundered and been lost at sea but it "may have been cut off by Natives."
877	*Seventy Six*	Trading Schooner	Dec 11, 1895	Lost at sea while on a trading cruise. Seven lives lost.
1026	*Name Unknown*	Russian Baidara	Feb 10, 1830	Disregarding the warnings of local Aleuts, the vessel set out in bad weather and wrecked with 20 lives lost. Parts of the vessel, clothes, and other pieces of wreck washed ashore at Crane Bay.
1038	*Urania*	Schooner	Dec 29, 1876	Disappeared with all hands and passengers and a cargo of furs.
2147	*Yukon*	Passenger Steamship	Feb 4, 1946	The well-known Alaska Steamship Co. liner *Yukon* grounded on sharp rocks in a severe gale. Fifty-foot breakers hammered the ship and she broke in two, carrying away 11 people. The remaining passengers and crew, some of whom had made it to a narrow beach, were rescued by a flotilla of seven ships, including the Coast Guard cutter *Onandaga* and lighthouse tender *Cedar*. Salvage attempted in 1946 and 1955 without success.
518571	*Cajun Mama*	Unknown	May 26, 1992	Rolled in high seas and sank.
592909	*Sundancer*	Longline Fishing Vessel	Sep 8, 1991	Vessel took a rogue wave, had a 35-degree list, rolled over, and sank.
640429	*Little Ann*	Longline Fishing Vessel	May 1, 1990	Vessel went down by the bow and sank. All eight persons on board were picked up.

Source: USDOI, Minerals Management Service, Alaska OCS Region 2008

3.10.2.1 Previous Analyses

Impacts related to cultural resources from training activities were previously evaluated in Section 1.6.2.1 and Appendix L of the *Alaska Military Operations Areas EIS* (USAF 1995), Section 3.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), Sections 3.18 and 4.18 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and Sections 3.12, 4.12, and 9.3 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

Consultation with the Alaska SHPO was conducted during the preparation of the *Alaska MOA EIS* and the *Transformation of U.S. Army Alaska FEIS*. A copy of SHPO correspondence regarding the *Alaska MOA EIS* is provided in Appendix C of this EIS/OEIS. Based on the previous consultations, no further analysis of prehistoric and historic archaeological resources on land is required.

3.10.2.2 Regulatory Framework

Laws and Regulations

Numerous laws and regulations mandate that possible effects on important cultural resources be considered during the planning and execution of federal undertakings. These laws define the compliance process and federal agency responsibilities, and prescribe the relationship among other involved agencies such as the Advisory Council on Historic Preservation (ACHP) and SHPO.

Federal mandates include provisions of NEPA and Sections 106 and 110 of the National Historic Preservation Act (NHPA) and their implementing regulations at 40 Code of Federal Regulations (C.F.R.) 1500 and 36 C.F.R. 800, respectively.

- Under NEPA, for all federal actions that could significantly affect the quality of the human environment, agencies must consider the effect an action would have on cultural resources, including prehistoric and historic resources, architectural resources, and traditional cultural properties that are eligible for listing in the NRHP (i.e., historic properties).
- Section 106 includes the mandate to assess the significance and integrity of those cultural resources to determine eligibility for listing in the NRHP. The NRHP eligibility criteria are defined by the Secretary of the Interior's Standards for Evaluation in 36 C.F.R. 60. Regulations at 36 C.F.R. 800.8 provide for coordination of public participation, consultation, and evaluation to meet the purpose and requirements of both NEPA and NHPA in a timely and efficient manner.
- Section 110 of the NHPA requires inventory of cultural resources present in the Area of Potential Effect (APE).

As required in these regulations, the Navy has complied with the requirements for using the NEPA process to achieve Section 106 compliance. Groups that have been formally notified about the project include Alaska Native tribes, the Alaska SHPO, and the ACHP. The Navy also has undertaken public involvement activities throughout development of the EIS/OEIS and the Final EIS/OEIS will be forwarded to these groups for their review and comment.

Other laws that may be relevant include:

- Antiquities Act of 1906 (16 United States Code [U.S.C.] 431);
- Historic Sites Act of 1935;
- Submerged Lands Act of 1953; and
- Archaeological Resource Protection Act of 1979 (16 U.S.C. 470aa-470mm), which prohibits the removal of items of archaeological interest from federal lands without a permit.

The Abandoned Shipwreck Act of 1987 extends the jurisdiction of abandoned shipwrecks in State waters (up to 3 nm [5.5 km] from shore), considering them U.S. property, and then transfers management authority to the states; None of the TMAA is located within State waters. The NPS's Abandoned Shipwreck Act Guidelines are published in 55 Federal Register (FR) 50116, 55 FR 51528, and 56 FR 7875. Lost U.S. Navy vessels and downed aircraft remain the property of the U.S. regardless of where they were lost or the passage of time. These properties are administered by the U.S. Naval Historical Center, a facility that has begun an underwater archaeological program to inventory shipwrecks under Navy jurisdiction, including those owned or managed by the Navy.

In 2004, the Sunken Military Craft Act (passed as Title XIV of the fiscal year 2005 National Defense Authorization Act) preserved the "sovereign status of sunken U.S. military vessels and aircraft by codifying both their protected sovereign status and permanent U.S. ownership regardless of the passage of

time." This act recognizes the probable historic status of the craft and the fact that these craft often contain the remains of U.S. military personnel. The Sunken Military Craft Act explicitly states that the protection of the law "shall not be extinguished by the passage of time, regardless of when the sunken military craft sank regardless of age."

Military regulations that mandate protection of cultural resources as part of the Navy's mission include:

- Chief of Naval Operations Instruction 5090.1C: Environmental Readiness Program Manual (2007);
- Secretary of the Navy Instruction 11010.14A: Department of the Navy Policy for Consultation with Federally Recognized Indian Tribes (2005);
- Department of Defense Directive (DoDD) 4710.1: Archeological and Historic Resources Management (1984);
- Department of Defense (DoD) Instruction (DoDINST) 4715.3: Environmental Conservation Program (1996).
- DoD American Indian and Alaska Native Policy (1998);
- DoDD 3200.15 10: Sustainment of Ranges and Operating Areas (2003);
- DoDINST 4710.02: DoD Interactions with Federally Recognized Tribes (2006);
- Alaska Implementation Guidance of the DoD American Indian and Alaska Native Policy (2007).

Under the NHPA, the APE typically includes areas within which land-based or nearshore activities could potentially affect NRHP-listed or -eligible historic properties, including archaeological and traditional cultural resources. Also included in an APE are any at-sea locales where bombing, operations, or equipment might affect submerged ruins, sites, features, or shipwrecks. Depending on location, vessel affiliation, and whether the wreck meets the criteria of abandonment, shipwrecks in coastal waters may fall under the jurisdiction of the individual state, or one or more federal agencies, or may belong to other nations. Depending on the proposed activities, the APE can also include land, nearshore, and at-sea areas where proposed Navy training activities could potentially affect ethnographic resources, traditional cultural properties, or traditional uses such as the tribal fishery grounds.

Government-to-Government Consultation

Government-to-government consultation with federally recognized Native American tribes and nations was outlined in an April 29, 1994, presidential memorandum titled, "Government-to-Government Relations with Native American Tribal Governments." Native American sacred sites were included in EO 13007, May 24, 1996. EO 13175, *Consultation and Coordination with Tribal Governments*, was issued in 2000 to establish collaboration with American Indian tribal governments.

Alaska Native Tribes

Alaska Natives tribes are in themselves diverse, representing twenty language groups comprised of Inupiaq, Yupik (Central and Siberian), Aleut, Alutiiq, Eyak, Haida, Tsimshian, Tlingit, and eleven interior Alaska Athabaskan peoples such as Gwich'in and Tanaina. Many individuals still only speak their indigenous languages. There are 229 federally recognized tribes in Alaska constituting 40% of the nation's total. The 2000 census indicated 19% of the Alaska population is Alaska Native or American Indian versus less than 0.5 % for the contiguous United States. Living off the land or "subsistence" as it is called in Alaska is a lifestyle adhered to more with Alaska Natives than American Indians today. Coastal Alaska tribes subsist principally off marine mammals and fish. The tribes nearest the TMAA include the Alutiiq, Eyak and Tlingit groups; however, there is no subsistence use of the TMAA.

Of the 229 federal tribes in Alaska, this EIS/OEIS takes into consideration comments resulting from government-to-government consultation, which has been offered to the Alaska Native tribes listed in Table 3.10-2 given their general proximity to the TMAA. Letters were sent to each tribe by Alaskan Command (ALCOM), Elemendorf Air Force Base (AFB), in March 2008 (see example letter in Appendix C). The result was that all 12 tribes replied to ALCOM via telephone or letters indicating that they have no concerns over the proposed activities described within this EIS/OEIS. The Navy will, however, keep the tribes informed of the timeframes of future joint training exercises.

Table 3.10-2: Tribes Offered Consultation

Name of Tribe	Location
Kaguyak Village	Akhiok
Lesnoi Village	Green Island
Native Village of Afognak	Kodiak
Native Village of Chenega	Chenega Bay
Native Village of Eyak	Cordova
Native Village of Old Harbor	Old Harbor
Native Village of Ouzinkie	Ouzinke
Native Village of Port Graham	Port Graham
Native Village of Port Lions	Port Lions
Native Village of Tatitlek	Tatitlek
Shoonaq Tribe of Kodiak	Kodiak
Yakutat Tlingit Tribe	Yakutat

Alaska State Historic Preservation Officer/Advisory Council on Historic Preservation

In accordance with Section 106 of the NHPA, the Navy entered into consultation with the Alaska SHPO. On 18 May, 2010, the Alaska SHPO signed a letter indicating concurrence with the Navy's analysis that the Proposed Action would not affect submerged cultural resources (see correspondence in Appendix C).

3.10.2.3 Approach to Analysis

Federal laws and regulations have established the requirements for identifying, evaluating, and mitigating impacts on cultural resources. Pertinent provisions of NHPA, Archaeological Resources Protection Act, and Native American Graves Protection and Repatriation Act address management and treatment of cultural resources. Under NHPA, resource significance is determined on the basis of NRHP criteria (36 C.F.R. § 60.4) in consultation with SHPO. A project affects a resource's significance when it alters the characteristics of the property that qualify it as significant under NRHP criteria. Effects may include:

- Physical destruction or damage to all or part of the resource;
- Alteration of a property in a way that is inconsistent with the Secretary's Standards for the Treatment of Historic Properties (36 C.F.R. Part 68);
- Introduction of visual, atmospheric, or audible elements that alter the setting and diminish the integrity of the property's significant features;
- Neglect of a resource, resulting in its deterioration or destruction; and
- Any change that could adversely affect the qualities that make the property significant.

Data Sources

Information on the locations of resources was obtained from the *Shipwreck Database* (USDOI, Minerals Management Service, Alaska OCS Region 2008), which includes the following:

- Alaska Shipwreck Customs Report of Casualty 1741-1939 (1982)
- Marine Disasters of the Alaska Route (1916)
- The History of Alaska, 1730-1885 (1886)
- Marine Resources Assessment for the Gulf of Alaska Operating Area (2006)
- A List of Trading Vessels in the Maritime Fur Trade, 1785-1825 (1973)
- Alaskan Shipping, 1867-1978: Arrivals and Departures at the Port of Sitka (1972)
- Sourcebook of Alaskan Shipwrecks 1786-1932 (1984)
- Database of Fishing Vessel Incidents, 1989-2004 (1989-2004)
- Alaska OCS Region Shipwreck Database (2008)
- Archaeological Overview of Alaska (2004)
- Lewis and Dryden's Marine History of the Pacific Northwest (1967)
- Other environmental and reference documents from the area, as cited.

Assessment Methods

Under NHPA, assessing impacts involves identifying activities that could directly or indirectly affect significant resources, identifying known or expected significant resources in the area of potential effects, and determining the level of impacts on the resources. Possible findings include no effect, no adverse effect, or an adverse effect on significant resources (36 C.F.R. § 800.4-9).

3.10.2.4 No Action Alternative

Training activities in the TMAA take place in the air, on the ocean surface, and subsurface. No historic resources, traditional cultural properties, or areas containing resources exploited for subsistence use are known to exist within the TMAA. There are nine shipwrecks that are believed to be within the TMAA but given some are relatively recent, not all would be considered historic resources. Submerged cultural resources (shipwrecks) will not be affected by the proposed training activities given these activities do not come in contact with or otherwise impact the historic integrity of any submerged cultural resources.

Under the No Action Alternative, the Navy would continue to conduct training activities within the TMAA. Effects of offshore training activities on cultural resources are limited to training expendable materials (e.g., targets, sonobuoys, and bombs, missiles, and other ordnance) falling into the ocean and potentially settling on submerged cultural resources. These effects from training on historic resources are negligible because there is only one shipwreck believed to be located the middle of the TMAA (as opposed to the edge) where training activities are likely. The probability of expendable material landing on a submerged cultural resource is so extremely low it can be discounted. In addition, the settling of material on submerged cultural resources will have no more adverse effect than the gradual accumulation of natural sediments on such resources. In addition, the only shipwreck that has been determined eligible for inclusion in the National Register is outside the TMAA situated north of Kodiak Island, approximately 65 mi (120 km) from the TMAA.

3.10.2.5 Alternative 1

Under Alternative 1, the number of Navy training events in the TMAA would increase (refer to Table 2-7). The nature of the training activities, however, would not change substantially. Aerial, surface, and subsurface training activities would not affect submerged cultural resources resting on or buried in bottom sediments.

Under Alternative 1, a Portable Undersea Tracking Range (PUTR) would be used to support Anti-Submarine Warfare (ASW) training in the TMAA where the ocean depth is between 300 ft and 12,000 ft. The PUTR is a self-contained, portable, undersea tracking capability that employs modern technologies to support safe and coordinated undersea warfare training for Forward Deployed Naval Forces (FDNF). The system will be capable of tracking submarines, surface ships, weapons, targets, and Unmanned Underwater Vehicles (UUVs) and distribute the data to a data processing and display system, either aboard ship, or at a shore site. When training is complete, the PUTR equipment would be recovered.

No area supporting a PUTR system has been identified; however, potential impacts to cultural resources can be assessed based on several assumptions. The Navy would avoid known resource sites in the placement of the PUTR equipment. Upon completion of the exercise, the transponders are recovered. This eliminates any potential long term impacts associated with hazardous materials such as batteries and electronic components. Effects of PUTR training activities on cultural resources are limited to transponders settling on submerged resources. These effects on historic resources are negligible because there are few underwater cultural resources, and they are widely dispersed. The probability of a transponder landing on a resource is very low and, in any case, the temporary settling of transponder on submerged resources will have no more adverse effect than the gradual accumulation of natural sediments on such resources. Deployment and use of the PUTR under Alternative 1 would not affect submerged cultural resources.

3.10.2.6 Alternative 2

Implementation of Alternative 2 would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional separate summertime Carrier Strike Group exercise lasting up to 21 days within the ATA.
- Conduct a Sinking Exercise (SINKEX) in each summertime exercise (a maximum of two) in the TMAA.

SINKEX

A SINKEX is typically conducted by aircraft, surface ships, and submarines in order to take advantage of a full size ship target and an opportunity to fire live weapons. Ship, aircraft, and submarine crews typically are scheduled to attack the target with coordinated tactics and deliver live ordnance to sink the target. As such, aspects of the exercise that have potential effects on submerged cultural resources include the presence of expended materials (fragments of missiles and bombs) as well as the sunken target vessel itself. The effects from expended materials on historic resources has been addressed previously and are negligible because there are few underwater cultural resources, and they are widely dispersed. The probability of anything landing on a resource is very low and, in any case, the settling of small amounts of expended materials on submerged resources will have no more effect than the gradual accumulation of natural sediments on such resources.

Alternative 2 would expend two surface vessels per year during SINKEX. By rule, SINKEX would be conducted at least 50 nm (93 km) offshore and in water at least 6,000 feet deep (1,830 m) (40 CFR 229.2). As shown in Figure 3.10-1, there is only one known shipwreck that is further than 50 nm (93 km) offshore and within the TMAA. The probability of a sunken vessel settling on a submerged cultural resource is extremely unlikely and can be discounted. Therefore, conducting a SINKEX would not impact submerged cultural resources.

Under Alternative 2, the number of Navy training events in the TMAA would increase (refer to Table 2-7). These increases, which would also include SINKEX, would not change from those described under the other alternatives. Aerial, surface, and subsurface training activities would not affect submerged cultural resources resting on or buried in bottom sediments.

3.10.3 Mitigation

No substantial impacts on cultural resources from the proposed activities were identified. Therefore, no additional mitigation measures are necessary or appropriate.

3.10.4 Summary of Effects

Table 3.10-3 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on cultural resources under both NEPA and EO 12114.

Table 3.10-3: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to cultural resources onshore would occur. • Aircraft overflights above 15,000 ft (915 m) altitude between the shore and the TMAA would have no impact on cultural resources.	• Submerged cultural resources would not be impacted because of the type of training activities and the low density of submerged cultural resources within the area of effect.
Alternative 1	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to cultural resources onshore would occur. • Aircraft overflights above 15,000 ft (915 m) altitude between the shore and the TMAA would have no impact on cultural resources.	• Submerged cultural resources would not be impacted because of the type of training activities and the low density of submerged cultural resources within the area of effect.

Table 3.10-3: Summary of Effects by Alternative (continued)

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 2 (Preferred Alternative)	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to cultural resources onshore would occur. • Aircraft overflights above 15,000 ft (915 m) altitude between the shore and the TMAA would have no impact on cultural resources.	• Submerged cultural resources would not be impacted because of the type of training activities and the low density of submerged cultural resources within the area of effect.

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3.11 Transportation & Circulation

3.11 TRANSPORTATION AND CIRCULATION

3.11.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for transportation and circulation includes the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.11.1.1 Existing Conditions

Air Traffic

The offshore Special Use Airspace (SUA) of the TMAA overlies the surface and subsurface operating area. This overwater airspace supports aircraft training activities generally conducted by the Navy and Air Force aircraft. This SUA extends from the ocean surface to 60,000 feet (ft) (18,288 meters [m]) mean sea level, and encompasses 42,146 square nautical miles (nm^2) (145,482 square kilometers [km^2]) of airspace.

Additionally, a portion of Warning Area (W-612) lies within the northwestern quadrant of the TMAA over Blying Sound (Figure 3.11-1). The airspace provides 2,256 nm^2 (8,766 km^2) of SUA and extends from the ocean surface up to Flight Level (FL) 290. Military pilots travel under Instrument Flight Rules (IFR) flight plans from local air bases until they reach W-612 and proceed under Visual Flight Rules (VFR) while operating within it or the TMAA. When W-612 is active, aircraft on IFR clearances are precluded from entering the warning area by the FAA. However, since W-612 is located entirely over international waters, nonparticipating aircraft operating under VFR are not prohibited from entering the area. Examples of aircraft flights of this nature include light aircraft, fish spotters, and whale watchers.

When not included as part of the TMAA, W-612 is used by USAF aircraft to conduct training in Anti-Air Warfare (AAW) and by the United States Coast Guard (USCG) to fulfill some of its training requirements. Activation of the warning areas by the Federal Aviation Administration (FAA) is performed by notifying the controlling air traffic agency of the change in status. This allows the agency to issue an advanced warning via a Notice to Airmen (NOTAM) or provide real-time notices and deconfliction to pilots to alter their courses to avoid military activities.

Military Aviation

Military aircraft operating in the TMAA can originate from aircraft carriers offshore in the TMAA or from military airfields in Alaska. Aircraft taking off from aircraft carriers operating in the TMAA will launch under Visual Meteorological Conditions or Instrument Meteorological Conditions and proceed to their designated working area within the TMAA or W-612. When operating within the confines of the TMAA or W-612, military aircraft will operate using a "see-and-avoid" rule to remain clear of other air traffic. Aircraft taking off from military airfields will normally file for and receive an IFR clearance from FAA Air Traffic Control Center. This clearance will provide them with the routing to the inland SUA, either via the normal jet route structure, via special instructions as assigned by the FAA, or some combination of both. Once within the TMAA or W-612, flights proceed via VFR, using a "see-and-avoid" rule to remain clear of other air traffic. Subsequent to leaving the TMAA, these aircraft will have contacted and activated their return IFR clearance with the FAA.

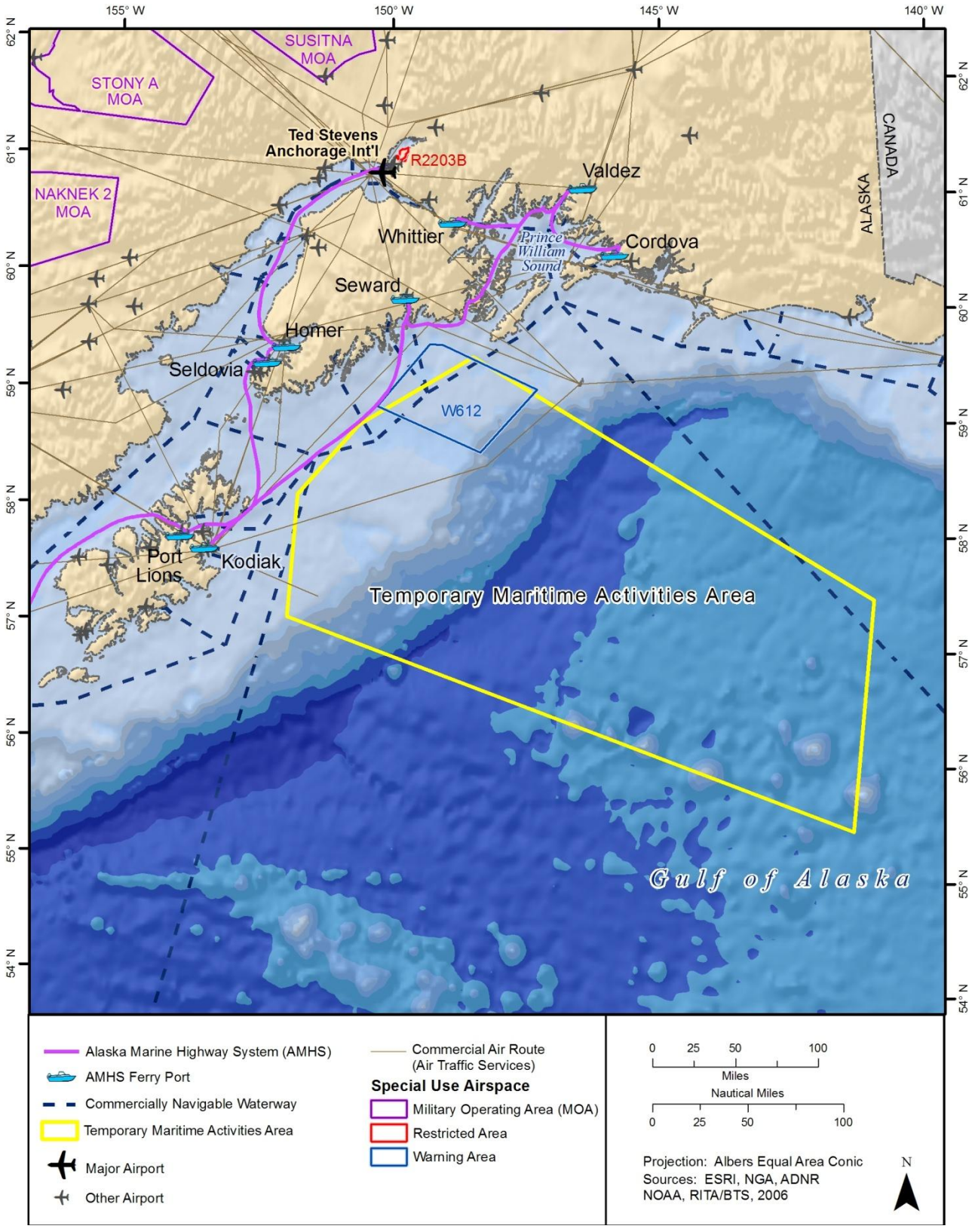


Figure 3.11-1: Air and Marine Traffic in Vicinity of the TMAA

Commercial and General Aviation

Aviation is an important and basic mode of transportation in Alaska because approximately 90 percent of Alaska is not served by roads. Alaska has six times as many pilots per capita and 16 times as many aircraft per capita compared to the rest of the United States. Aircraft operating under VFR can fly along the Alaska coast, largely unconstrained, except by safety requirements and mandated traffic flow requirements. Aircraft operating under IFR clearances, authorized by the FAA, normally fly on the airway route structures (see Figure 3.11-1). These routes include both high- and low-altitude routes. When W-612 is active, aircraft on IFR clearances are precluded from entering the warning area.

Marine Traffic

A significant amount of ocean traffic, consisting of both military, Coast Guard, commercial, and recreational vessels transit through the GOA. For commercial vessels, the major transoceanic routes enter the TMAA briefly to transit (see Figure 3.11-1). The approach and departure routes into the inland waters can be adjusted depending on Navy activities notification through Notices to Mariners (NOTMARs) found at http://www.navcen.uscg.gov/lnm/d17/.

Military

Military traffic consists of the transit of large military vessels at sea, including submarines. The TMAA surface/subsurface operating area is depicted in Figure 3.11-1. Total surface area of the TMAA is 42,146 nm^2 (145,482 km^2). The TMAA undersea training area lies beneath the surface and extends to the seafloor. Commander, Submarine Force, U.S. Pacific Fleet[1] manages this underwater space as transit lanes and operational areas for U.S. submarines.

Civilian

Marine vessels, large and small, transit the GOA to several commercial ports occurring near the TMAA. Vessel traffic approaching these ports is managed by the Vessel Traffic Service, which is operated jointly by the United States Coast Guard (USCG) and the Marine Exchange of Alaska (a nonprofit organization established to serve the Alaska Maritime Community by providing information, communications, and services to ensure safe, secure, efficient, and environmentally responsible maritime operations). The Vessel Traffic Center is located in Valdez at the north end of Prince William Sound (USCG Navigation Center n.d.). The ocean traffic flow in congested waters, especially near coastlines, is controlled by the use of directional shipping lanes for large vessels, including cargo, container ships, and tankers. Traffic flow controls are also implemented to ensure that harbors and ports-of-entry remain as uncongested as possible.

Two major ports close to the TMAA, Anchorage and Valdez, were ranked in the top 150 U.S. ports by tonnage in 2000 (U.S. Department of Transportation Research and Innovative Technology Administration/Bureau of Transportation Statistics 2001). Commercially navigable waterways traverse the TMAA, but are controlled by the use of directional shipping lanes for large vessels (cargo, container ships, and tankers) (see Figure 3.11-1). Ships traveling from major ports to the Lower 48 states and Hawaii as well as marine traffic between coastal ports enter the TMAA briefly, but Navy activities are communicated to all vessels and operators by use of NOTMARs found at http://www.navcen.uscg.gov/lnm/d17/.

[1] The Commander Submarine Force, U.S. Pacific Fleet is the principal advisor to the Commander in Chief, U.S. Pacific Fleet for submarine matters. The force provides anti-submarine warfare, anti-surface ship warfare, precision land strike, mine warfare, intelligence, surveillance, and early warning and special warfare capabilities to the U.S. Pacific Fleet and strategic deterrence capabilities to the U.S. Strategic Command.

In addition to large commercial vessels traversing the GOA, the Alaska Marine Highway System (AMHS) provides ferry service for passengers and vehicles between coastal communities (AMHS 2007). The Southwest Alaska route services Prince William Sound, Kodiak Island, the Alaska Peninsula, and the Aleutian Islands. The ferry route closest to the TMAA provides service to Chenega Bay in the Prince William Sound and the town of Kodiak on Kodiak Island (see Figure 3.11-1). The route is one of the least busy routes with only 12 sailings in 2007 (AMHS 2007).

3.11.1.2 Current Requirements and Practices

Safety and security factors dictate that use of airspace and control of air traffic be closely regulated. The Navy strives to ensure that it retains access to ocean training areas and SUA as necessary to accomplish its mission, while facilitating joint military-civilian use of such areas to the extent practicable and consistent with safety. The regulatory scheme for airspace and air traffic control varies from highly controlled to uncontrolled. Less controlled situations include flight under VFR or flight outside of U.S. controlled airspace, such as flight over international waters off the coast of Alaska. Examples of highly controlled air traffic situations are flights in the vicinity of airports, where aircraft are in a critical phase of flight, either takeoff or landing, and flight under IFR, particularly flight on high- or low-altitude airways.

Accordingly, regulations applicable to all aircraft are promulgated by the FAA to define permissible uses of designated airspace, and to control that use. These goals of military access, joint use, and safety are promoted through various coordination and outreach measures, including:

- NOTAMs advising of the status and nature of activities being conducted in W-612, and other components of SUA in the TMAA. NOTAMs are available via the internet at https://pilotweb.nas.faa.gov/.
- Return of SUA to civilian FAA control when not in use for military activities. According to FAA and Department of Defense policy, SUA, including warning areas, should be made available for use by nonparticipating aircraft when all or part of the airspace is not needed by the using agency. To accommodate the joint use of SUA, a Letter of Authorization (LOA) or a Letter of Procedure is drafted between the controlling agency and the using agency. The LOA establishes the activation/deactivation procedures for the SUA and may outline periods when the FAA, with the Navy's concurrence, may route IFR traffic through the active SUA. The LOA defines the conditions and procedures to ensure safe and efficient joint use of warning areas. The FAA does not prohibit aircraft operating under VFR from entering warning areas that overlie international waters.

The Navy provides publication of NOTMARs and other outreach information about potentially hazardous activities planned for the TMAA, for publication by the USCG in NOTMARs. To ensure the broadest dissemination of information about hazards to commercial and recreational vessels, the Navy provides schedule conflicts along with other Coast Guard concerns at: http://www.navcen.uscg.gov/lnm/d17/.

3.11.2 Environmental Consequences

As noted in Section 3.11.1, the ROI for transportation and circulation includes the TMAA and ocean areas in the vicinity used for Navy air and marine transportation. Navy training activities that occur within the Air Force inland SUA and the Army inland ranges were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 1997, Army 1999, Army 2004) These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) are analyzed in this EIS/OEIS pursuant to EO 12114.

3.11.2.1 Previous Analyses

Impacts related to transportation and circulation were previously evaluated in Sections 3.2 and 4.2 of the *Alaska Military Operations Areas EIS* (USAF 1995), Sections 3.2.3 and 4.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), Sections 3.16 and 4.16 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999); and Sections 3.19 and 4.19 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.11.2.2 Approach to Analysis

The principal issue is the potential for existing or proposed military air or vessel traffic to affect existing transportation and circulation conditions. Impacts on traffic were assessed with respect to the potential for disruption of transportation pattern and systems, and changes in existing levels of transportation safety.

Factors used to assess the significance of impacts on air traffic include consideration of an alternative's potential to result in an increase in the number of flights such that they could not be accommodated within established operational procedures and flight patterns; a requirement for an airspace modification; or an increase in air traffic that might increase collision potential between military and nonparticipating civilian operations.

Factors used to assess the significance of impacts on ocean vessel traffic include the extent or degree to which an alternative would disrupt the flow of commercial surface shipping or recreational fishing or boating. A serious disruption occurs when a vessel is unable to proceed to its intended destination due to exclusion from areas in the TMAA.

3.11.2.3 No Action Alternative

Both military and non-military entities have been sharing the use of the airspace and ocean surface comprising the TMAA for decades. Military, commercial, and general aviation users have established an operational coexistence consistent with federal, state, and local plans and policies and compatible with each interest's varying objectives. Activities under the No Action Alternative include activities that are and have been routinely conducted in the area for decades.

Air Traffic

Navy aviation activities travelling from the TMAA to inland training areas have the potential to affect commercial and recreational air traffic. Section 2.1.2.1 of the Northern Edge Exercise Final EA-OEA (2008) describes the proposed Western Altitude Reservation (ALTRV). An ALTRV is a flight clearance corridor provided by the FAA, for a "block of airspace" used to conduct activities and/or allow aircraft to transit from one area to another. Such would be the case when military aircraft leave the TMAA enroute to the inland SUA of the Air Force. During training activities, aircraft operating within the ALTRV will be under positive control of the FAA and will comply with all FAA flight rules. Figure 3.11-2 is an example of an ALTRV that could be used to accommodate aircraft overflights between the TMAA and the inland training ranges. In coordination with the FAA, the ALTRV will be reassessed each exercise year for suitability and functionality and may change to accommodate the needs of the military and the FAA. Due to the coordination between the FAA and the military, no impacts are expected to occur from overflights to commercial and general aviation.

Warning areas such as W-612 have been established to coordinate offshore civilian and military uses. When military aircraft are conducting activities that are not compatible with civilian activity, military aircraft is confined to the designated SUA, which is specifically designed to coordinate incompatible activities. Limitations are communicated to commercial airlines and general aviation by NOTAMs, published by the FAA. Because of these precautions, there will be no adverse effects on commercial or general aviation activities as a result of the No Action Alternative.

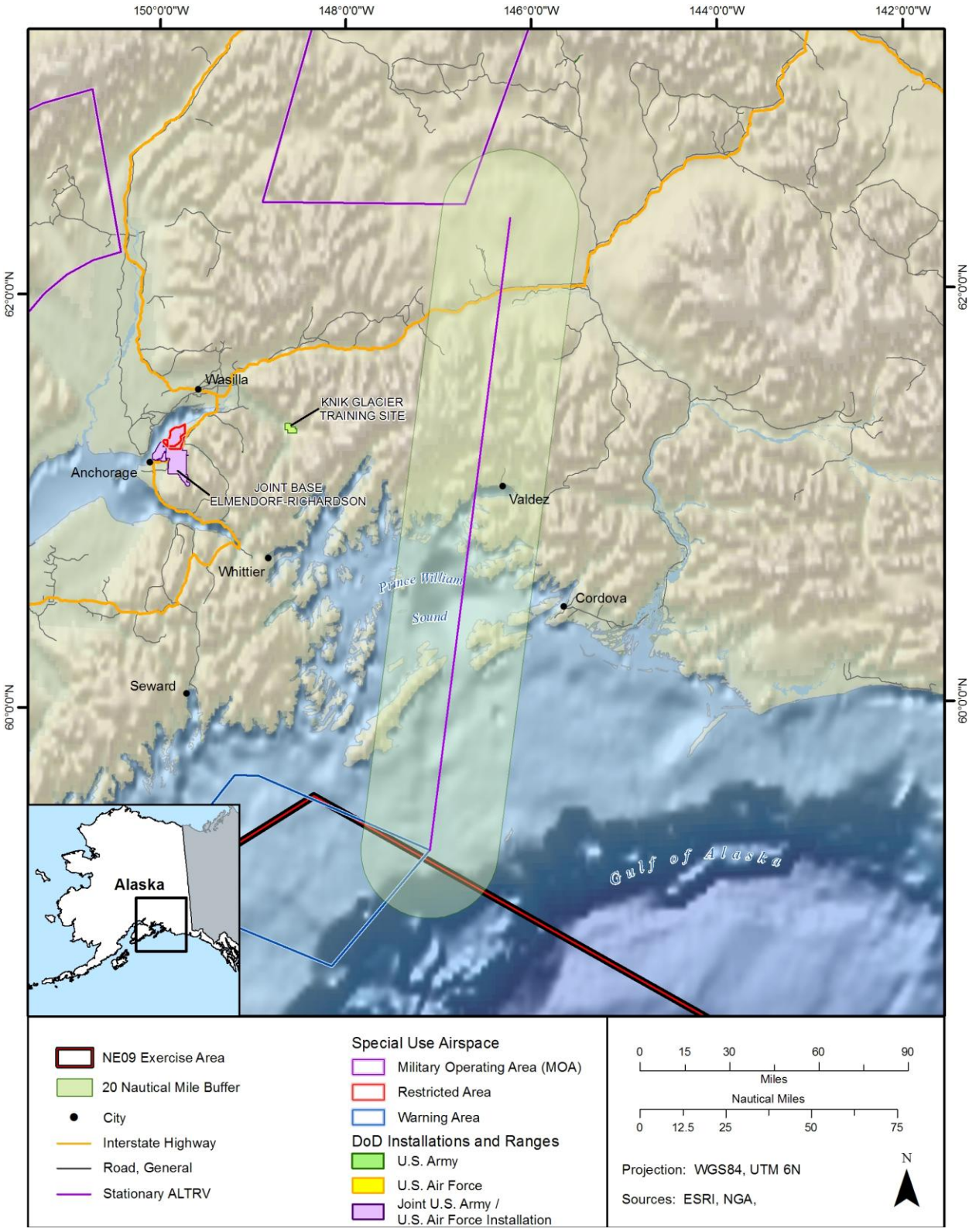


Figure 3.11-2: Example of a Temporary ALTRV between the TMAA and Inland Ranges

Marine Traffic

Military use of the TMAA is generally compatible with civilian use. Where naval vessels are conducting activities that are not compatible with other uses, they typically operate in areas away from shipping lanes to allow traffic to flow freely. If training activities occur within shipping or high traffic areas, these activity areas are communicated to all vessels and operators by NOTMARs, published by the USCG. Navy activities do not have an effect on recreational marine traffic because public activities are centered at local harbors and anchorages away from the TMAA and vessels are not precluded from entering the TMAA to transit to their desired locations. In the interest of safety, the Navy may temporarily exclude commercial and recreational marine traffic from small operational areas and require slight deviations from the intended course or the use of alternate routes. However, the use of alternative routes as a result of these temporary exclusions does not constitute a significant disruption to marine traffic. Based on the discussion above, there will be no adverse effects on commercial or recreational marine traffic under the No Action Alternative.

3.11.2.4 Alternative 1

Alternative 1 would have all the components of the No Action Alternative with the addition of one training instrumentation enhancement with the potential to impact marine traffic in the offshore area: a Portable Undersea Tracking Range (PUTR). The PUTR involves the temporary placement of seven electronics packages on the seafloor, each approximately 3 ft (0.9 m) long by 2 ft (0.6 m) in diameter. Although no specific locations have yet been identified, the electronic packages would be placed in water depths greater than 600 ft (182 m), at least 3 nm (5.5 km) from land. Because this is a temporary installation (to be recovered once training is complete), no formal restricted areas would be designated and no limitations would be placed on commercial or civilian use of the area, thus limiting impacts to marine traffic.

Air Traffic

The FAA has established warning areas for military operations, in this case, W-612. Offshore activities proposed under Alternative 1 would have all the components of the No Action Alternative, but the training tempo would increase, resulting in more air traffic. The traffic control procedures implemented under this alternative would be the same as those described above under the No Action Alternative. No additional impacts on the FAA's capabilities would be created. The remoteness of the offshore use areas, the use of LOAs and the ALTRV to better orchestrate traffic, and public notification procedures would substantially reduce possible congestion during these activities. Because of these precautions, there will be no adverse effects on commercial or general aviation activities as a result of Alternative 1.

Marine Traffic

Military use of the TMAA under Alternative 1 has all the components of the No Action Alternative, but the training tempo and number of assets would increase, resulting in more marine traffic. The same general procedures as described above under the No Action Alternative would be implemented for Alternative 1. Additionally, Alternative 1 would include the installation and use of the PUTR. Implementation of the PUTR would require the Navy to issue a NOTMAR to advise the public of the PUTRs existence and general location. Despite an increase in training tempo, marine traffic would not be affected by military operational increases. Increased Navy activities would not have an effect on marine traffic because public activities are centered at local harbors and anchorages away from the TMAA and vessels would not be precluded from entering the TMAA to transit to their desired locations.

As described above for the No Action Alternative, there will be no adverse effects on commercial or recreational marine traffic under Alternative 1. In addition, because the PUTR is a temporary installation (to be recovered once training is complete), no formal restricted areas would be designated and no formal

limitations would be placed on commercial or civilian use of the area, thus limiting impacts to marine traffic from the PUTR.

3.11.2.5 Alternative 2

Alternative 2 would have all the components of Alternative 1 (accommodating training activities currently conducted, increasing specific training activities to include the use of active sonar, and accommodating force structure changes). In addition, under Alternative 2 the following activities would occur:

- Conduct one additional separate summertime CSG exercise lasting up to 21 days within the ATA.
- Conduct a Sinking Exercise (SINKEX) in each summertime exercise (a maximum of two) in the TMAA.

Air Traffic

Effects on air traffic would be the same as those described under Alternative 1. Offshore activities proposed under Alternative 2 would have all the components of Alternative 1, but the training tempo would increase and the addition of a SINKEX would result in more air traffic. No additional impacts on the FAA's capabilities would be created. For safety purposes, the locations of SINKEX activities will be in areas that are not generally used by non-military aircraft. Prior to the commencement of a SINKEX, extensive range clearance procedures are conducted (Section 5.2.1.2) in conjunction with the defined operational parameters listed in the Letter of Instruction (LOI), which establishes precise ground rules for the safe and successful execution of the exercise.

The remoteness of the TMAA, the use of LOA's, NOTAMs, LOI, and the ALTRV to better orchestrate traffic, and public notification procedures would substantially reduce possible congestion during these activities. Because of these precautions, there will be no adverse effects on commercial or general aviation activities as a result of Alternative 2.

Marine Traffic

Effects on marine traffic would be the same as those described under Alternative 1. Despite an increase in training tempo and the inclusion of two SINKEXs, commercial and recreational interests would not be affected by military operational increases.

Navy clearance measures for live-fire training exercises would be implemented, and, therefore, marine traffic would not be affected during a SINKEX. For safety purposes, the locations of SINKEX activities will be in areas that are not generally used by non-military watercraft. Prior to the commencement of a SINKEX and following the issuance of a NOTMAR, extensive range clearance procedures are conducted (Section 5.2.1.2) in conjunction with the defined operational parameters listed in the Letter of Instruction (LOI), which establishes precise ground rules for the safe and successful execution of the exercise.

Increased Navy activities would not have an effect on marine traffic because public activities are centered at local harbors and anchorages away from the TMAA and vessels would not be precluded from entering the TMAA to transit to their desired locations. The use of NOTMARS and other public notification procedures would also be used to give the public advanced notification of Navy activities.

3.11.3 Mitigation

No adverse effects on air or marine traffic were identified. Therefore, no additional mitigation measures are necessary.

3.11.4 Summary of Effects

Current protective measures are described in Section 3.11.1.3; these procedures substantially lower the risk of Navy training activities on transportation and circulation. Table 3.11-1 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on transportation and circulation under both NEPA and EO 12114.

Table 3.11-1: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to inland transportation and circulation would occur. • With the use of the ALTRV, overflights would have no adverse impact on non-military air or marine traffic.	• No adverse effects on commercial or general aviation would occur. Limitations are communicated to commercial airlines and general aviation by NOTAMs. • No adverse effects on marine traffic would occur. When training activities occur within shipping or high traffic areas, these activity areas are communicated to all vessels and operators by NOTMARs published by the USCG.
Alternative 1	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to inland transportation and circulation would occur. • With the use of the ALTRV, overflights would have no adverse impact on non-military air or marine traffic.	• Effects on air and marine traffic would be the same as described under the No Action Alternative. No additional impacts on the FAA's capabilities would be created as a result of proposed training increases under Alternative 1. • Marine traffic will not be affected by military operational increases. • Installation and use of the temporary PUTR will not affect air and marine traffic.
Alternative 2 (Preferred Alternative)	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to inland transportation and circulation would occur. • With the use of the ALTRV, overflights would have no adverse impact on non-military air or marine traffic.	• Effects on air and marine traffic would be the same as described under Alternative 1. There are no adverse effects to air or marine traffic as a result of implementation of Alternative 2. • Marine Traffic will not be affected by military operational increases. • Installation and use of the temporary PUTR will not affect air and marine traffic. • With implementation of LOI, range clearance procedures, and NOTMARs, SINKEX will not affect non-military transportation and circulation.

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3.12 Socioeconomics

3.12 SOCIOECONOMICS

3.12.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for socioeconomics includes the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). With the exception of Cape Cleare on Montague Island located over 12 nautical miles (nm) (22 kilometers [km]) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore. Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.12.1.1 Existing Conditions

Commercial Shipping

The GOA is traveled by large and small marine vessels, with several commercial ports occurring near the TMAA. Two major ports near the TMAA, Anchorage and Valdez, were ranked in the top 150 U.S. ports by tonnage in 2000 (U.S. Department of Transportation Research and Innovative Technology Administration/Bureau of Transportation Statistics 2001). Commercially used waterways traverse the TMAA, but are controlled by the use of directional shipping lanes for large vessels (cargo, container ships, and tankers). Ships traveling from major ports to the Lower 48 and Hawaii as well as marine traffic between coastal ports enter the TMAA briefly, but Navy activities are communicated to all vessels and operators by use of Notice to Mariners (NOTMARs) found at http://www.navcen.uscg.gov/lnm/d17/default.htm. In addition to large commercial vessels traversing the GOA, the Alaska Marine Highway System (AMHS) provides ferry service for passengers and vehicles between coastal communities (AMHS 2007).

Commercial Fishing

Commercial fishing takes place throughout the GOA waters and in coastal inlets and bays. The North Pacific Fishery Management Council (NPFMC) is one of eight regional fishery management councils established by the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (MSFCMA) for the purpose of managing fisheries 3 to 200 miles (mi) (1.8 to 370 kilometers [km]) offshore of the U.S. coastline (Carroll 2008). The primary responsibility of the NPFMC is the groundfish fisheries in the federal waters of the Bering Sea and the GOA. The groundfish include cod, flatfish, mackerel, Pollock, sablefish, and rockfish species outside of three miles offshore. Other large Alaska fisheries such as salmon, crab and herring are managed by the State of Alaska Department of Fish & Game (ADF&G).

The commercial fish resources of Alaska are of great importance to the economies of the state and the nation (Carlile et al. 2005). Most groundfish fisheries in the U.S. Exclusive Economic Zone (EEZ) are managed by the National Marine Fisheries Service (NMFS) (ADF&G 2008a). The NMFS Alaska Regional Office maintains commercial catch data for groundfish in federal waters. The TMAA spans the Central and Eastern regulatory areas, west of Prince William Sound and east of Chirkiof (Figure 3.12-1) (NMFS 2008). In 2007, the Central regulatory area yielded 71,210 metric tons of groundfish which equaled approximately 54 percent of the total groundfish catch for the entire GOA. Groundfish fisheries in state waters are not discussed, as the TMAA exists outside of state waters.

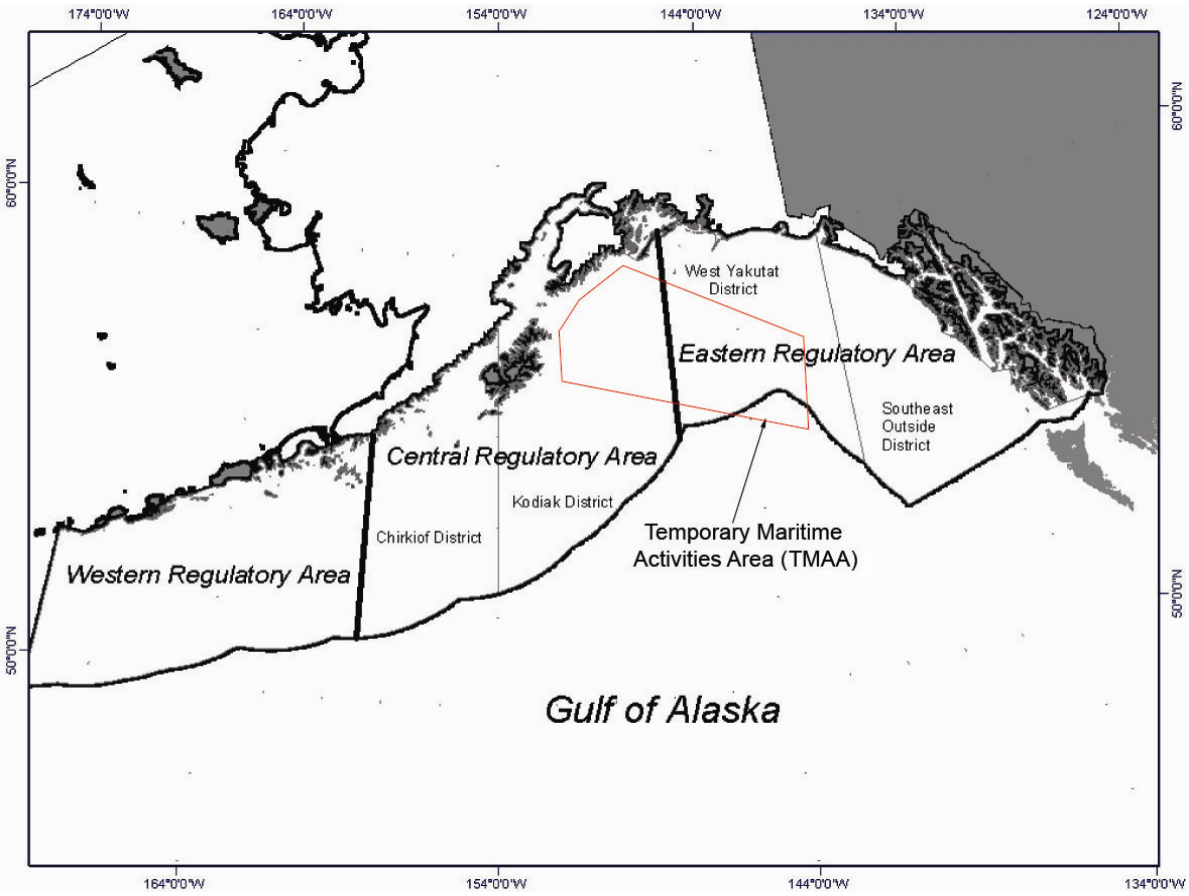


Figure 3.12-1: NMFS Regulatory Areas

Alaska's commercial fisheries produce large volumes of shellfish, including several types of crab and shrimp (ADF&G 2008b). All commercial shellfish fisheries in state and federal waters are managed by the ADF&G. Ocean areas with fisheries near the TMAA are located around Kodiak Island. Dungeness and Tanner crabs are the two types of crabs harvested near Kodiak. In 2007, fisheries near Kodiak Island yielded approximately 522 metric tons of Tanner and Dungeness crabs, approximately 2 percent of the total crustacean catch (ADF&G 2007).

Weathervane scallops are the only scallop commercially harvested in Alaska at this time (ADF&G 2008c). Commercial fishing for weathervane scallops occurs in the GOA, Bering Sea, and Aleutian Islands where scallops occur in distinct beds composed of sand, silt, and clay. A major bed in the GOA is located off the coast of Kodiak Island. Individual catch data for the Kodiak beds is not maintained; however, the ADF&G states that between 1998 and 2002, one of the largest harvests came from the Kodiak area averaging 82 metric tons each year (Carlile et al. 2005). As a comparison, 222 metric tons were collected statewide for the 2006-2007 season (ADF&G 2007).

Recreation and Tourism

Recreation and tourism is another resource of economic importance in the GOA. Recreation and tourist areas around the TMAA include the Kenai Peninsula, Kodiak Island, Prince William Sound, and Resurrection Bay (Alaska Department of Natural Resources 2008). There are 9 state parks on the Kenai Peninsula as well as Kenai Fjords National Park, 6 on the island of Kodiak, 14 marine parks in Prince William Sound, and 5 in Resurrection Bay. The parks offer a variety of activities close to shore such as sea kayaking, saltwater and freshwater fishing, and recreational boating (Figure 3.12-2). Most recreational

boating occurs close to shore in protected coves because of dangerous Gulf waters (National Park Service 2007).

Many people choose to navigate the GOA on ferries giving them spectacular views of glaciers, fjords, lush forests, and concentrations of seabirds and marine wildlife. Cruise travel along the GOA is a popular recreational activity and is the fastest growing tourist trade (city-data.com 2008). With excellent fishing and stunning coastal scenery, many visitors to the GOA choose to tour the area by boat and can choose from single-day to multi-day cruises (Alaska Travel Industry Association 2008).

Whale watching in Southcentral Alaska and the GOA occurs between June and early September, with August being the prime viewing month. A number of charter boat companies run whale watching cruises throughout the area.

In 2007, a total of 69,948 boats were registered statewide with Kenai and Kodiak accounting for 9,737 and 1,789 boats, respectively (Division of Motor Vehicles 2007). The totals do not account for thousands more small boats and watercraft that do not require registration.

3.12.1.2 Current Requirements and Practices

Long-range advance notice of scheduled activities and times are made available to the public and the commercial fishing community via the Internet. The local 17th District U.S. Coast Guard (USCG) NOTMARs may be found at: http://www.navcen.uscg.gov/lnm/d17/. The Federal Aviation Administration (FAA) Notices to Airmen (NOTAMs) may be found on the FAA publication webpage: https://pilotweb.nas.faa.gov/. These sites provide commercial fishermen, recreational boaters, pilots, and other area users notice that the military will be operating in a specific area and will allow them to plan their own activities accordingly. Military actions may temporarily relocate civilian and recreational activities. Schedules will be updated when changes occur with sufficient prior notice. If activities are cancelled at any time, this information is posted and the area is identified as clear for public use (Department of the Navy [DoN] 2007). To minimize potential military/civilian interactions, the Navy would continue to publish scheduled potentially hazardous training activities using the NOTAM and NOTMAR systems as applicable.

3.12.2 Environmental Consequences

As noted in Section 3.12.1, the ROI for socioeconomics includes the TMAA. Navy training activities that occur within the Air Force inland Special Use Airspace and the Army inland ranges were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) are analyzed in this EIS/OEIS pursuant to Executive Order (EO) 12114.

3.12.2.1 Previous Analyses

Impacts related to socioeconomics were previously evaluated in Sections 3.10 and 4.10 of the *Alaska Military Operations Areas EIS* (USAF 1995), Sections 3.2.6 and 4.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), Sections 3.19 and 4.19 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and Sections 3.13 and 4.13 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

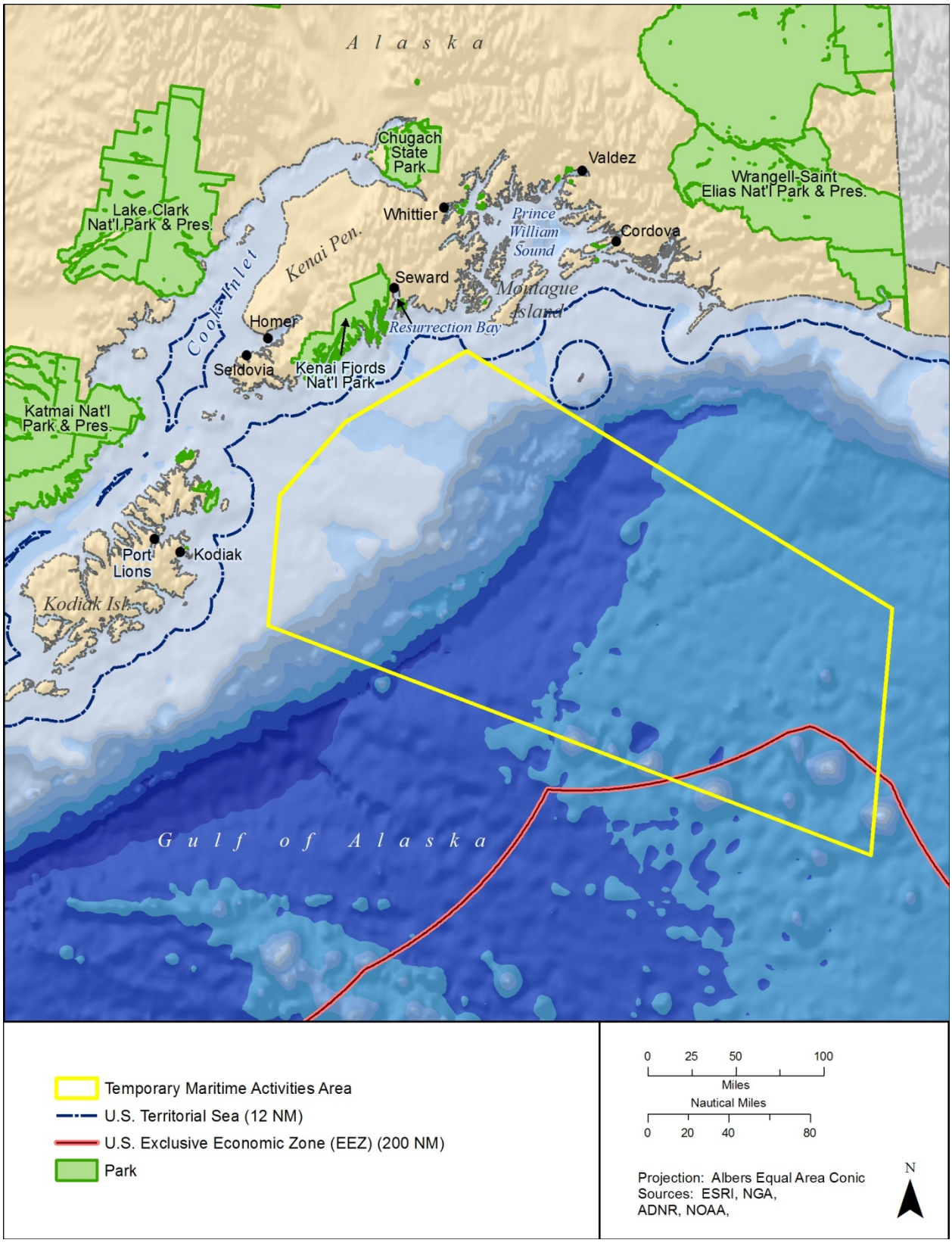


Figure 3.12-2: Parks and Recreation near the TMAA

3.12.2.2 Approach to Analysis

This analysis investigates the potential for activities associated with each of the alternatives to noticeably affect (either adversely or beneficially) socioeconomic activity in the GOA. Because there are no permanent population centers in the ROI, typical socioeconomic considerations such as population, housing, employment, economic growth, and associated services and infrastructure are not applicable. Additionally, training activities in the TMAA are not expected to significantly alter access to subsistence fishing areas or affect subsistence fishing resources because these fishing activities are generally located outside of the TMAA. The analysis for potential effects on socioeconomics focuses on those activities specific to commercial shipping, commercial fishing, recreation, and tourism in the GOA.

3.12.2.3 No Action Alternative

Civilian activities currently conducted in the TMAA include commercial shipping, commercial fishing, and tourist-related activities. These activities make an appreciable contribution to the overall economy of Alaska. The Navy has performed military activities within this region in the past and has not precluded fishing or recreational uses in the TMAA, even during peak fishing seasons. Under the No Action Alternative, training activities occur less than 6% of the year and are only conducted over a single period of up to 14 days. When training needs to be conducted during this period, a NOTMAR is issued. This measure provides mariners with Navy use areas in advance, which allows nonparticipants to select an alternate destination without appreciable effect to their activities. To help manage competing demands and maintain public access in the GOA, the Navy conducts its offshore activities in a manner that minimizes impacts to commercial fisherman (DoN 2007).

The activities proposed in the TMAA overlap in time and space with five International Pacific Halibut Commission statistical areas, the groundfish fishery areas, and the salmon fishing areas. However, the Navy does not exclude fishing activities from occurring in the TMAA during the training activities. The Navy has been training in the Gulf of Alaska for decades and is not aware of any negative interactions with the fishing community to date. Therefore, the Navy does not expect there to be any interruption in the frequency or location availability of fishing areas. An exception would be if there is a Navy training activity already taking place (such as a live fire exercise) that would require a temporary restriction to that area for safety reasons. This restriction could be expected to be several hours in duration (depending on activity). However, for safety purposes, Navy standard operating procedures will halt any activity when non-participants are present in the training area.

Fisheries research is a significant activity that is conducted in the GOA. Prior to commencing an exercise, the Navy will issue NOTAMs or NOTMARs informing the public of the training exercises. In addition, Navy standard operating procedures will halt any Navy training activities when non-participants are present in the training area. Therefore, no conflicts would occur with fisheries research and management activities, because the Navy will stop training activities or relocate to a different area.

Overflights associated with 300 sorties would occur above the TMAA. Most aircraft overflights would occur over the TMAA at elevations in excess of 15,000 ft (915 m). All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m). Though aircraft overflights produce noise and some of this sonic energy would reach the air-water interface, these activities are not expected to alter access to commercial or recreational fishing areas or affect commercial or recreational fishing resources. As described in Section 3.6.2.3, the behavioral responses that could occur from exposure to overflight noise would not compromise the general health or condition of individual fish and, as such, commercial or recreational fishing resources.

Many different types of commercial fishing gear are used in the GOA: gillnets, longline gear, troll gear, trawls, seining, and traps or pots. Damage to fishing gear from Navy activities in the TMAA is rare.

When damage does occur to commercial fishing gear due to Navy actions (i.e., net entanglement, destruction of buoys), the fishermen (or the owner of the property damaged) can file a claim with the DoN under the Federal Tort Claims Act (FTCA) under the provisions of 28 U.S. Code (U.S.C.) Section 2671, et seq. and request reimbursement. Forms for filing an FTCA claim can be obtained from any Navy Legal Services Office. Reimbursement requests must be made within 2 years of incurring damage.

3.12.2.4 Alternative 1

The increase in number of activities for the TMAA amounts to a 13 percent increase in the training activities over the No Action Alternative. Though the number of activities will increase under Alternative 1, training activities will continue to occur during a single period of up to 21 days, or 6% of the available training days in a year. To minimize potential military/civilian interactions, the Navy would continue to publish scheduled potentially hazardous training activities using the NOTAM and NOTMAR systems as applicable. This ensures that commercial and recreational users are aware of the Navy's plans, and allows users to plan their activities to avoid the scheduled activity (DoN 2007).

For years, fisheries in various parts of the world have complained about declines in their catch after acoustic activities (including naval exercises) moved into the area, suggesting that noise is seriously altering the behavior of some commercial species. Based on the analysis presented in Section 3.6 (Fish) of the EIS/OEIS, some marine fish may be able to detect mid-frequency sounds; most marine fish are hearing generalists and have their best hearing sensitivity below mid-frequency sonar. If they occur, behavioral responses would be brief, reversible, and not biologically significant. Sustained auditory damage is not expected. Sensitive life stages (juvenile fish, larvae, and eggs) very close to the sonar source may experience injury or mortality, but area-wide effects would likely be minor. The use of Navy mid-frequency sonar would not compromise the productivity of fish or adversely affect their habitat. Similar to the No Action Alternative, commercial fishing and fisheries research and management activities would not be impacted under Alternative 1.

Under Alternative 1, a Portable Undersea Tracking Range (PUTR) would be implemented. The PUTR involves the temporary placement of seven electronics packages (sensors) on the seafloor, each approximately 3 feet (ft) (0.9 m) long by 2 ft (0.6 m) in diameter and placed in a configuration on the seafloor with an area of 25-100 nm^2 (86-343 km^2). Although no candidate locations have yet been identified, the electronic packages would be placed in water depths greater than 600 ft, at least 3 nm from land. Because this is a temporary installation—to be recovered once training is complete—no permanent restricted areas would be designated. While use of the PUTR by Fleet ships and aircraft would have no socioeconomic impact to the region, the gear placement on the seafloor could be incompatible with certain commercial fishing activities. Implementation of the PUTR would require the Navy to issue a NOTMAR to limit the possibility of any interactions with fishing activities that could damage or disturb the sensors. If, as a part of complying with the NOTMAR, fishing activities are voluntarily shifted to a different area, this could place an economic hardship on commercial fishing enterprises if the range is deployed in a viable fishing area. However, the Navy will, to its utmost ability, avoid commercially viable fishing areas when placing the PUTR.

The increased training tempo, addition of sonar use, and the temporary installation of a PUTR, which could be up to 42 days per year, would not result in a negative effect on socioeconomics in the region due to advanced public notification, practicable range siting, and the primarily short-term duration of military activities.

3.12.2.5 Alternative 2

Alternative 2 includes all elements of Alternative 1 plus a further increase in the number of training activities in the TMAA. Training activities under Alternative 2 would occur over two distinct periods,

each up to 21 days. In addition, Alternative 2 includes a Sinking Exercise (SINKEX) to be performed in each of the summer time exercises. As described in Section 2.6.1.1, SINKEX operations occur in the open ocean (at least 1,000 fathoms [6,000 ft] deep) where there are no sensitive marine resources or benthic fishing grounds. The stressors associated with SINKEX have been analyzed separately in previous sections, and while serious injury and/or mortality to individual fish would be expected if they were present in the immediate vicinity of several of these stressors (e.g., explosive ordnance), SINKEX under Alternative 2 would not result in impacts to fish populations and, thus, commercial fishing operations based on the low number of fish that would be affected.

To minimize potential military/civilian interactions, the Navy would continue to publish scheduled potentially hazardous training activities using the NOTAM and NOTMAR systems as applicable. This ensures that commercial and recreational users are aware of the Navy's plans, and allows users to plan their activities to avoid the scheduled activity (DoN 2007). The increased training tempo, as well as the addition of SINKEXs, would not result in a negative effect on socioeconomics in the region due to advanced public notification and the primarily short-term duration of military activities. Similar to the No Action Alternative, commercial fishing and fisheries research and management activities would not be impacted under Alternative 2.

3.12.3 Mitigation

No effects to socioeconomics were identified; therefore, no mitigation measures are necessary.

3.12.4 Summary of Effects

Table 3.12-1 summarizes the socioeconomic effects of the No Action Alternative, Alternative 1, and Alternative 2 under both NEPA and EO 12114.

Table 3.12-1: Summary Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to socioeconomics would occur. • Overflights would not result in adverse effects to commercial shipping, commercial fishing, recreation, or tourism.	• No adverse impacts to commercial/recreational fishing, fisheries research/management, civilian access, or tourism would occur as a result of the No Action Alternative.
Alternative 1	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to socioeconomics would occur. • Overflights would not result in adverse effects to commercial shipping, commercial fishing, recreation, or tourism.	• No adverse impacts to commercial/recreational fishing, fisheries research/management, civilian access, or tourism would occur as a result of Alternative 1. • Use of the PUTR by Fleet ships and aircraft would have no socioeconomic impact to the region. • Gear placement for the PUTR on the seafloor could be incompatible with certain commercial fishing activities.

Table 3.12-1: Summary Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 2 (Preferred Alternative)	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to socioeconomics would occur. • Overflights would not result in adverse effects to commercial shipping, commercial fishing, recreation, or tourism.	• No adverse impacts to commercial/recreational fishing, fisheries research/management, civilian access, or tourism would occur as a result of Alternative 2. • Use of the PUTR by Fleet ships and aircraft would have no socioeconomic impact to the region. • Gear placement for the PUTR on the seafloor in a 25-100 nm^2 (86-343 km^2) area could be incompatible with certain commercial fishing activities. • SINKEX under Alternative 2 would not result in impacts to fish populations and thus commercial fishing operations.

3.13 Environmental Justice & Protection of Children

3.13 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

3.13.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for environmental justice and protection of children includes the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). With the exception of Cape Cleare on Montague Island located over 12 nautical miles (nm) (22 kilometers [km]) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm offshore. Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.13.1.1 Existing Conditions

The TMAA consists of open water surface and subsurface operating areas and overlying airspace. As such, there are no population centers present in the TMAA.

3.13.2 Environmental Consequences

As noted in Section 3.13.1, the ROI for environmental justice and protection of children includes the TMAA. No population centers are found within the TMAA. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) are analyzed in this EIS/OEIS pursuant to Executive Order (EO) 12114. Navy training activities that occur within the Air Force inland Special Use Airspace and the Army training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents are incorporated by reference.

3.13.2.1 Previous Analyses

Impacts related to environmental justice and protection of children were previously evaluated in Appendix P of the *Alaska Military Operations Areas EIS* (USAF 1995), Sections 3.2.6 and 4.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), Sections 3.21 and 4.21 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and Sections 3.18 and 4.18 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.13.2.2 Regulatory Framework

Environmental Justice

Executive Order 12898 (EO 12898), *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, was issued on February 11, 1994. This EO requires each federal agency to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies and activities on minority populations and low-income populations in the United States and its territories and possessions. The Environmental Protection Agency (EPA) and the Council on Environmental Quality (CEQ) have emphasized the importance of incorporating environmental justice review in the analyses conducted by federal agencies under the NEPA and of developing protective measures that avoid disproportionate environmental effects on minority and low-income populations. Objectives of this EO as it pertains to this EIS/OEIS include development of federal agency implementation strategies and identification of minority and low-income populations where proposed federal actions have disproportionately high and adverse human health or environmental effects.

Protection of Children

The President issued EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, in 1997. This order requires that each federal agency "(a) shall make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children; and (b) shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks."

Regulatory actions covered under EO 13045 include those that may be "economically significant" (under EO 12866 [*Regulatory Planning and Review*]) and "concern an environmental health risk or safety risk that an agency has reason to believe may disproportionately affect children." Furthermore, EO 13045 defines "environmental health risks and safety risks [to] mean risks to health or to safety that are attributable to products or substances that the child is likely to come in contact with or ingest (such as the air we breathe, the food we eat, the water we drink or use for recreation, the soil we live on, and the products we use or are exposed to)." To comply with the EO, this document addresses child-specific environmental health and safety risks.

3.13.2.3 Approach to Analysis

Environmental factors related to environmental justice or protection of children are identified and assessed for disproportionate effects on minority populations, low-income populations, or populations of children.

3.13.2.4 No Action Alternative

Under the No Action Alternative, no effects to air quality, water resources, acoustic environment, fish, socioeconomics, or public safety that may disproportionally affect minority or low-income populations within inland areas have been identified in previous Army or Air Force documents (discussed in Section 3.13.2.1). All discussion of effects of Navy activities on children within inland areas have been analyzed by prior Army and Air Force documents discussed in Section 3.13.2.1.

Training activities in the TMAA are not expected to significantly alter access to subsistence fishing areas or affect subsistence fishing resources because these fishing activities are generally located outside of the TMAA. Overflights associated with 300 sorties would occur above the TMAA. Most aircraft overflights would occur over the TMAA at elevations in excess of 15,000 ft (915 m). All aircraft overflights between the shore and 12 nm (22 km) from land would occur at altitudes at or above 15,000 ft (915 m). Though aircraft overflights produce noise and some of this sonic energy would reach the air-water interface, these activities are not expected to alter access to subsistence fishing areas or affect subsistence fishing resources. Therefore, because no effects are anticipated, no disproportionately high and adverse effects on any low-income or minority groups would occur as a result of implementation of the No Action Alternative. With regard to effects on children, there are no population centers within the TMAA. Therefore, no effects on children would occur as a result of implementation of the No Action Alternative.

3.13.2.5 Alternative 1

Under Alternative 1, the number of activities for the TMAA amounts to a 13 percent increase in the training activities over the No Action Alternative. Though the number of activities will increase under Alternative 1, training activities will continue to occur during a single period of up to 21 days, or 6% of the available training days in a year. However, under Alternative 1, effects would be the same as those identified under the No Action Alternative because no population centers are found within the TMAA. Potential effects on inland areas have been analyzed within existing Army and Air Force documents (discussed in Section 3.13.2.1) and no disproportionately high and adverse effects on low-income or minority populations have been identified.

3.13.2.6 Alternative 2

Alternative 2 includes all elements of Alternative 1 plus a further increase in the number of training activities in the TMAA. Training activities under Alternative 2 would occur over two distinct periods, each up to 21 days. In addition, Alternative 2 includes a Sinking Exercise to be performed in each of the summer time exercises. However, under Alternative 2, effects would be the same as those identified under the No Action Alternative because no population centers are found within the TMAA. Potential effects on inland areas have been analyzed within existing Army and Air Force documents (discussed in Section 3.13.2.1) and no disproportionately high and adverse effects on low-income or minority populations have been identified.

3.13.3 Mitigation

No effects to environmental justice or protection of children were identified; therefore, no mitigation measures are necessary.

3.13.4 Summary of Effects

Table 3.13-1 summarizes the Environmental Justice (EO 12898) and Protection of Children (EO 13045) effects of the No Action Alternative, Alternative 1, and Alternative 2 for environmental justice and protection of children under both NEPA and EO 12114.

Table 3.13-1: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to environmental justice or protection of children would occur. • No effects are anticipated from training activities and overflights; no disproportionately high and adverse effects on any low-income or minority groups would occur. • There are no population centers found within the TMAA. Therefore, no effects on children would occur as a result of implementation of the No Action Alternative.	• No permanent human population centers exist in non-U.S. territorial seas and subsistence uses occur mostly outside of the TMAA. Therefore, no impacts related to environmental justice or protection of children would occur.

Table 3.13-1: Summary of Effects by Alternative (continued)

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 1	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to environmental justice or protection of children would occur. • No effects are anticipated from training activities and overflights; no disproportionately high and adverse effects on any low-income or minority groups would occur. • There are no population centers found within the TMAA. Therefore, no effects on children would occur as a result of implementation of Alternative 1.	• No permanent human population centers exist in non-U.S. territorial seas and subsistence uses occur mostly outside of the TMAA. Therefore, no impacts related to environmental justice or protection of children would occur under Alternative 1.
Alternative 2 (Preferred Alternative)	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts related to environmental justice or protection of children would occur. • No effects are anticipated from training activities and overflights; no disproportionately high and adverse effects on any low-income or minority groups would occur. • There are no population centers found within the TMAA. Therefore, no effects on children would occur as a result of implementation of the Alternative 2.	• No permanent human population centers exist in non-U.S. territorial seas and subsistence uses occur mostly outside of the TMAA. Therefore, no impacts related to environmental justice or protection of children would occur under Alternative 2.

3.14 Public Safety

3.14 PUBLIC SAFETY

Public safety concerns are assessed in terms of the potential for Navy training activities to injure civilians or put them at risk in any way. Impacts may arise directly as physical injuries from hazardous activities or indirectly as a result of exposure to hazardous materials expended during a training event. Activities that could affect public safety include surface and subsurface ship movements, aircraft movements, use of munitions, and emissions of acoustic and electromagnetic energy (e.g., sonar and radar). These potential sources of safety risks were identified by a detailed analysis of training activities, geographic locations, and Navy standard operating procedures and protocols. It is Navy policy to prevent personal injury or property damage by observing every possible precaution in the planning and execution of all Navy training activities.

3.14.1 Affected Environment

For purposes of this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), the Region of Influence (ROI) for public safety includes the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA). Areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Areas EIS* (U.S. Air Force [USAF] 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.14.1.1 Existing Conditions

Operating Areas

Military, commercial, institutional, and recreational activities take place in the TMAA. The Navy conducts hazardous activities, such as missile firings, naval gunfire, and air-to-surface ordnance delivery, in international waters within the TMAA. The Federal Aviation Administration (FAA) has established Warning Area 612 (W-612) for military activities; W-612 is open to public co-use most of the time. The public typically uses the TMAA for shipping, aviation, tourism, boating, and commercial fishing, which includes salmon, crab, and shellfish harvesting. Recreational activities include whale watching and fishing (Department of Navy [DoN] 2008). Commercial and recreational vessels are allowed to operate in the TMAA, the surface waters are accessible to recreational and commercial boaters, and there are no continuously restricted zones in this area. Public use of offshore marine areas is a safety concern for the Navy because training activities occur primarily in international waters.

The TMAA also is used for subsistence harvesting by Alaska Natives. Alaska Natives rely heavily on the harvesting of marine mammals and fish that inhabit the TMAA. Designated subsistence-use areas are located within 3 nautical miles (nm) (5.5 kilometers [km]) of shore. Navy training exercises will not affect subsistence harvesting because the subsistence use areas are outside of the TMAA.

When hazardous training activities occur, and the Navy requires exclusive control for public safety concerns, Notices to Mariners (NOTMARs) and Notices to Airmen (NOTAMs) about the hazards are issued. In addition, during training activities in the TMAA, weapons delivery activities are delayed or cancelled if training areas are not clear of nonparticipants. A training area is considered a "Green Range" if the ordnance-area footprint is clear of all nonparticipating surface vessels, divers, and aircraft; if the training area is not clear, then the area is considered a "Red Range." Training can only be conducted if a "Green Range" is issued, and, if considered a "Red Range," training must be delayed until all nonparticipants are cleared and a "Green Range" is issued. These designations assure public safety during training activities that otherwise could harm nearby nonparticipants.

Ordnance Handling

As described in Chapter 2, some training activities use ordnance. The procedures for handling and storing ordnance are found in Naval Sea Systems Command (NAVSEA) Operational Procedures (OP) 5, *Ammunition and Explosives Ashore: Safety Regulations for Handling, Storing, Production, Renovation, and Shipping* (DoN 2001).

Public Access and Proximity

The waters of the TMAA are available to civilian vessels, except during hazardous training activities. During such activities, the public is excluded because of safety concerns. NOTMARs and NOTAMs are issued to notify the public about the hazards of operating vessels or aircraft in the vicinity. Additional Standard Operating Procedures (SOPs) and best management practices to assure public safety are discussed later in this section.

3.14.1.2 Current Requirements and Practices

Navy training activities in the TMAA comply with numerous established safety procedures to ensure that neither participants nor nonparticipants engage in activities that endanger life or property.

Fleet Area Control and Surveillance Facility Safety Procedures

Fleet Area Control and Surveillance Facility (FACSFAC) provides active management of assigned airspace, operating areas, ranges, and training resources to enhance combat readiness of U.S. Pacific Fleet units in all warfare areas. Although FACSFAC does not have procedures specific to the TMAA, Navy ships will comply with the FACSFAC procedures for their home base. FACSFAC procedures for other training areas, such as Southern California (SOCAL) Range Training Complex, would be sufficient for use in the TMAA because of the greater risk to public safety along the more densely populated California coast. FACSFAC San Diego has published safety procedures for activities on the offshore and nearshore areas (DoN 1997, 2004). These guidelines apply to range users as follows:

- Commanders are responsible for ensuring that impact areas and targets are clear prior to commencing hazardous activities.
- The use of underwater ordnance must be coordinated with submarine operational authorities. The coordination also applies to towed sonar arrays and torpedo decoys.
- Aircraft or vessels expending ordnance shall not commence firing without permission of the scheduling authority for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
- Vessels are authorized to fire their weapons only in offshore areas and at specific distances from land, depending on the caliber and range of the weapons fired. The larger the caliber, the farther offshore the firing must take place.
- Aircraft carrying ordnance to or from ranges shall avoid populated areas to the maximum extent possible.

Aircrews must be aware that nonparticipating aircraft are not precluded from entering the area and may not comply with a NOTAM or radio warnings that hazardous activities are scheduled or occurring. Aircrews are required to maintain a continuous lookout for nonparticipating aircraft while operating under visual flight rules in warning areas.

DoD Standard Operating Procedures

All training activities will comply with Department of Defense (DoD) Directive 4540.1, *Use of Airspace by U.S. Military Aircraft and Firings Over the High Seas*, and Chief of Naval Operations Instruction (OPNAVINST) 3770.4A, *Use of Airspace by U.S. Military Aircraft and Firing Over the High Seas*, which specify procedures for conducting aircraft maneuvers and for firing missiles and projectiles. The missile and projectile firing areas are to be selected "so that trajectories are clear of established oceanic air routes or areas of known surface or air activity" (DoD 1981).

Navy Standard Operating Procedures

In addition to FACSFAC procedures, the Navy has instituted the following SOPs at the Northwest Training Range Complex (NWTRC) Operational Areas and the SOCAL Range Training Complex. These SOPs are applicable to the TMAA because Navy ships conducting training in the TMAA will typically be based out of SOCAL or the NWRTC, and the activities conducted in SOCAL and NWTRC are similar to those conducted in the TMAA.

Aviation Safety

Aircraft fly under visual flight rules and under visual meteorological conditions. This means that the commanders of military aircraft are responsible for the safe conduct of their flight. Prior to releasing any weapons or ordnance, the impact area must be clear of nonparticipating vessels, people, or aircraft. The Officer Conducting the Exercise is ultimately responsible for the safe conduct of range training. A qualified safety officer is assigned to each training event or exercise, and can terminate activities if unsafe conditions exist.

Submarine Navigation Safety

Navigation safety, while submarines are submerged, consists of several methods used to alert submarine crews to the potential dangers of collision, both during training activities within Warning Areas and during transits to and from these training areas. Training areas are typically closed to sport and commercial fishing vessels during training activities to avoid ensnaring nets towed by fishing vessels. Closures are communicated by issuing NOTMARs. The surface is scanned visually and by radar for such vessels before and during training activities. During training activities in offshore areas, weapons delivery activities are delayed or cancelled if the training area is not clear. Prior to issuing a "Green Range," Navy personnel must ensure that the hazard footprint of the ordnance being fired is clear of nonparticipating surface vessels. During transit to and from training areas, submerged submarines use sonar and navigational maps that identify known fishing areas to avoid fishing vessels.

General Exercise Safety

Surface Vessels

Prior to launching a weapon, vessels are required to determine that all safety criteria have been satisfied, that the weapons and target recovery conditions are acceptable, and that recovery helicopters and boats are ready to be deployed.

Aircraft

Only hazardous activities require exclusive use of airspace, and these periods are scheduled and broadcast by the Navy through NOTAMs. Navy personnel must ensure that the hazard footprint of the ordnance being fired is clear of nonparticipating aircraft.

Live and Inert Ordnance

Whenever live or inert ordnance is expended, a qualified Range Safety Officer (RSO) is present. Units must ensure that the area can contain the hazard footprints of the weapons employed. RSOs ensure that these footprints are clear of personnel during training activities. After live-fire events, participating units ensure that weapons are safe and clear of live rounds. The RSOs are also responsible for the emergency medical evacuation of people from the area in case of a mishap.

Sonar

The Naval Sea Systems Command Instruction (NAVSEAINST) 3150.2, *Safe Diving Distances from Transmitting Sonar*, is the Navy's governing document for human divers in relation to active sonar systems; it provides procedures for calculating safe distances from active sonars. Such procedures are derived from experimental and theoretical research conducted at the Naval Submarine Medical Research Laboratory and the Navy Experimental Diving Unit.

Safety ranges vary based on conditions that include diver dress, type of sonar, and duration of time in the water. If low-frequency sonar (160 kilohertz (kHz) to 320 kHz) is used, divers should not be in the vicinity or should be warned that exposure is likely. Low-frequency sonar can cause dizziness, vertigo, skin tingling, or vibratory sensations in the throat and abdomen.

Electromagnetic Radiation

Communications and electronic devices such as radar, electronic jammers, and other radio transmitters produce electromagnetic radiation (EMR). Equipment that produces an electromagnetic field may generate hazardous levels of EMR. An EMR hazard exists when transmitting equipment generates an electromagnetic field that induces currents or voltages large enough to trigger electro-explosive devices in ordnance. EMR also can be a health hazard to people or an explosive hazard for fuel. EMR hazards are reduced or eliminated by establishing minimum separation distances between EMR emitters and people, ordnance, and fuel.

EMR effects are directly proportional to the frequency of the EMR source. For example, the lower the frequency of the EMR source, the lower the acceptable power density threshold before a potential hazard to human health exists. Likewise, the higher the frequency of the EMR source, the higher the acceptable power density threshold before health effects occur. Hazards of EMR to personnel, ordnance, and fuel have been determined for EMR sources based on frequency and power output.

Sources of EMR include radar, navigational aids, and Electronic Warfare (EW) hardware. These systems are the same as, or similar to, civilian navigational aids and radars at local airports and television weather stations throughout the United States. EW systems emit EMR similar to that from cell phones, hand-held radios, commercial radio, and television stations. SOPs in place to protect Navy personnel and the public include setting the heights and angles of EMR transmission to avoid direct exposure, posting warning signs, establishing safe operating levels, and activating warning lights when radar systems are operational. To avoid excessive exposures from EMR, military aircraft are operated in accordance with standard procedures that establish minimum separation distances between EMR emitters and people, ordnance, and fuels.

Lasers

Lasers may be used for precision range finding and as target designation devices for guided munitions. Laser safety procedures for aircraft require an initial pass over the target prior to laser activation to ensure that target areas are clear. During actual laser use, aircraft run-in headings are restricted to avoid unintentional contact with personnel or nonparticipants. Personnel participating in laser training activities

are required to complete a laser safety course. For training activities conducted in the TMAA, eye-safe lasers are used.

3.14.2 Environmental Consequences

As noted in Section 3.14.1, the ROI for public safety includes the TMAA. Navy training activities that occur within the Air Force inland Special Use Airspace and the Army inland training lands were evaluated under previous National Environmental Policy Act (NEPA) documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents are incorporated by reference. Environmental effects in the open ocean beyond the U.S. territorial seas (outside of 12 nm [22 km]) are analyzed in this EIS/OEIS pursuant to Executive Order (EO) 12114.

3.14.2.1 Previous Analyses

Impacts related to public safety were previously evaluated in Sections 3.2 and 4.2 of the *Alaska Military Operations Areas EIS* (USAF 1995), Sections 3.2.3 and 4.0 of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), Sections 3.16 and 4.16 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and Sections 3.17 and 4.17 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004).

3.14.2.2 Approach to Analysis

Public safety is considered to be affected if the general public is substantially endangered as a result of Navy activities on the ranges. For each training activity or group of similar activities, an estimate of risk to the general public was formulated, based on the Navy's current set of safety procedures for range activities. Navy training activities in the TMAA would be conducted in accordance with guidance provided in FACSFAC San Diego Instruction 3120.1, *Manual of EASTPAC and MIDPAC Fleet Operating Areas*. The instruction provides operational and safety procedures for all normal range activities. Its emphasis is on providing the necessary information to range users so that they can operate safely and avoid affecting non-military activities such as shipping, recreational boating, and commercial or recreational fishing (DoN 1997). Several factors were considered in evaluating the effects of the Navy's activities on public safety, including proximity to the public, ownership, access control, scheduling, public notification of events, frequency and duration of activities, range safety procedures, operational control of training events, and safety history.

Data Sources

Available reference materials, including prior Environmental Assessments (EAs) and EISs/OEISs, were reviewed and used where their information on training activities, policies, equipment, or environmental impacts was applicable. All current and proposed training activities were examined for the possibility of civilians entering a hazardous training environment. Current Navy safety procedures in existing Navy instructions were assessed to determine whether the procedures would protect the public from the hazardous training activities proposed in the alternatives.

Assessment Methods

Each alternative analyzed in this EIS/OEIS includes training activities in several warfare areas (e.g., Anti-Air Warfare, Anti-Surface Warfare), and most warfare areas encompass more than one training activity (e.g., Surface-to-Air Gunnery Exercise, Air-to-Surface Missile Exercise [MISSILEX]). Likewise, each activity has several elements (e.g., weapons firing, target deployment). Accordingly, this analysis is organized by specific activity rather than by warfare area (Table 3.14-1). The approach to the public safety analysis includes characterizing the training activities that may affect public safety in the TMAA. These activities include: missile flights; target expenditures; ship, vessel, and aircraft movements; and weapons firing. Training materials that could affect public safety include ordnance.

3.14.2.3 No Action Alternative

Fleet training activities will continue to be conducted in the TMAA. Training activities under the No Action Alternative are conducted once per year for up to 14 days. Some offshore activities will expend ordnance, sonobuoys, or targets from vessels or aircraft. The ordnance used in offshore training activities may have either live or inert warheads. The U.S. Navy's standard range safety procedures, as outlined in the SOPs discussed in Section 3.14.1.2, are designed to avoid risks to the public and to Navy activities.

Table 3.14-1: Training Activities Affecting Public Safety

Warfare Area	Activity	Ordnance	Aircraft/Ship Movement
Anti-Air Warfare (AAW)	Air Combat Maneuvers (ACM)		✓
	Air Defense Exercise (ADEX)		✓
	Surface-to-Air Missile Exercise	✓	✓
	Surface-to-Air Gunnery Exercise (GUNEX)	✓	✓
	Air-to-Air MISSILEX	✓	✓
Anti-Surface Warfare (ASUW)	Visit Board Search and Seizure (VBSS)	✓	✓
	Air-to-Surface MISSILEX		✓
	Air-to-Surface Bombing Exercise (BOMBEX)	✓	✓
	Air-to-Surface GUNEX	✓	✓
	Surface-to-Surface GUNEX	✓	✓
	Maritime Interdiction	✓	✓
	Sea Surface Control		✓
	Sinking Exercise (SINKEX)	✓	✓
Anti-Submarine Warfare (ASW)	ASW Tracking Exercise (TRACKEX)– Helicopter		✓
	ASW TRACKEX – Maritime Patrol Aircraft		✓
	ASW TRACKEX – Extended Echo Ranging	✓	✓
	ASW TRACKEX – Surface Ship		✓
	ASW TRACKEX – Submarine		✓
Electronic Combat (EC)	EC Exercises		✓
	Chaff Exercises	✓	✓
	Counter Targeting Exercises	✓	✓
Naval Special Warfare (NSW)	Insertion/Extraction		✓
Strike Warfare (STW)	Air-to-Ground BOMBEX	✓	✓
	Personnel Recovery		✓
Support Operations	Deck Landing Qualifications		✓

Training Area Clearance

The hazard footprint of the ordnance in use is based on the range of the weapon, and includes a large safety buffer to account for the item going off-target or malfunctioning. For activities with a large hazard footprint (e.g., MISSILEXs), special sea and air surveillance measures are taken to search for, detect, and clear the area of intended activities. Aircraft are required to make a preliminary pass over the intended target area to ensure that it is clear of boats, divers, or other nonparticipants. Aircraft carrying ordnance are not allowed to fly over surface vessels.

Target areas are cleared of nonparticipants prior to conducting training, so public safety issues will only occur if an activity exceeds the safety area boundaries or a nonparticipant is not identified prior to the start of training. Risks to public safety are reduced, in part, by providing termination systems on some of the missiles. In those cases where a weapon system does not have a flight termination capability, the target area is determined to be clear of unauthorized vessels and aircraft, based on the flight distance the vehicle can travel plus a 5-mile-long area beyond the system's performance parameters.

Undetonated Ordnance

Under the No Action Alternative, approximately 88 explosive ordnance items will be used during training exercises (see Table 3.6-7 for types of ordnance). Based on the estimated failure rates identified in Table 3.2-2, approximately 3.5 explosive ordnance items will be expected to fail and end up as undetonated ordnance on the ocean floor. Ordnance will be expended across 20 percent of the TMAA, which will result in approximately 0.0004 undetonated explosive items per square nautical mile (nm^2) or one undetonated explosive item per 2,500 nm^2. Undetonated ordnance will sink quickly to the ocean floor, where it will corrode, become encrusted by benthic organisms, and be buried through sedimentation.

Undetonated ordnance on the ocean floor may pose a risk to fishermen, particularly bottom trawlers. If a trawl contacted an undetonated ordnance item, the item could detonate. Most likely, the ordnance will not detonate because it failed to detonate upon impact with a training target or the water surface. While fisherman may contact undetonated ordnance, it will be unlikely given the large area of the TMAA.

Chaff

Chaff will be used during Chaff Exercises and Counter Targeting training activities under the No Action Alternative. The purpose of chaff is to counter avoid aircraft detection by radar by masking the aircraft and to provide false radar returns to defeat radar-guided anti-aircraft defensive systems. Chaff will form a large cloud of fiber that disperses slowly, which could affect public safety. Potential effects on safety include interference with communications or tracking systems, disruption of or interference with airborne and ground-based radar systems, damage or disruption of electrical power, and damage to aircraft through engine ingestion (USAF 1997). Navy training activities typically use training chaff, which is designed not to interfere with FAA radar frequencies. The Navy coordinates electronic countermeasures, including use of chaff, with FAA. FAA has established procedures for coordinating electronic countermeasure missions.

Although chaff could interfere with airborne and ground-based radar systems, the likelihood is low. Chaff will not be expected to affect radio communications, and coordination with FAA will reduce potential effects on public safety. Chaff will be dispersed upon deployment, and will not be expected gather in concentrations high enough to affect communication or radar systems.

Naval Special Warfare Activities

Specific NSW training events include insertion/extraction activities to hone individual skills in delivery and withdrawal of personnel and equipment using unconventional methods. Access control is the key to reducing the risk to the public due to the hazardous nature of NSW training. There is public access to the

TMAA, but NSW activities will pose little danger to public safety because no ordnance is expended. The Navy will ensure that the area is clear of civilian boats, divers, or aircraft before any potentially hazardous activity commences. Activities will be cancelled or delayed if there is any question about the safety of the public or the participants. Radio communications will be used extensively during training to avoid unsafe situations.

Prior public notification of Navy training activities, use of known training areas, avoidance of nonmilitary vessels and personnel, and the remoteness of the TMAA will reduce the potential for interaction between the public and Navy vessels during training activities. To date, these generally conservative safety strategies have been successful.

Aircraft Overflights

Aircraft overflights during training exercises and during transits to and from the TMAA and the inland training lands could affect public safety. Aircraft transit through an established Altitude Reservation (ALTRV). The ALTRV is a flight clearance corridor provided by the FAA. A description of a typical ALTRV is provided in Section 3.11, Transportation and Circulation. While operating within the ALTRV, aircraft are under positive control of the FAA, and comply with all FAA flight rules. Aircraft accidents are rare, but may occur during training activities. However, aircraft overflights would not have a substantial effect on public safety because of the use of the ALTRV, the FAA and military procedures, and flight rules that the participating aircraft must follow. With regard to the TMAA, there is a very low probability that an aircraft could collide with a public surface vessel or aircraft due to the remoteness of the TMAA and its relative size. Therefore, aircraft overflights pose little to no risk to public safety.

3.14.2.4 Alternative 1

Offshore activities proposed under Alternative 1 would have all the components of the No Action Alternative. Additionally, Alternative 1 would support an increase in training activities to include force structure changes associated with the introduction of new weapon systems and vessels into the fleet (Table 3.14-1). Under Alternative 1, baseline training activities generally would be increased. In addition, new ASW activities (including the use of active sonar) would be implemented. Force structure changes associated with new weapon systems would include sonobuoys, which would add a small number of detonations associated with the SSQ-110A Extended Echo-Ranging (EER)/Improved EER (IEER) sonobuoy. The safety procedures implemented under the No Action Alternative would continue to be implemented under Alternative 1. The remoteness of the TMAA, the use of temporary access restrictions, and public notification procedures would substantially reduce potential safety risks during these activities.

Several training activities would experience increases from current levels; increases in the number of individual training activities would increase the potential for conflicts with nonparticipants. However, given the Navy's comprehensive, conservative safety procedures and its excellent safety record for these activities, the actual potential for public safety impacts from training activities would remain very low. Potential for aircraft collisions with public surface vessels and aircraft would remain low because of the large area available in the GOA.

Training Area Clearance

Training area clearance procedures for hazardous activities under Alternative 1 would remain the same as under the No Action Alternative. These procedures would be adequate to prevent interactions with nonparticipants during training exercises.

Undetonated Ordnance

Under Alternative 1, approximately 168 explosive ordnance items would be used during training exercises (see Table 3.6-7 for types of ordnance). Based on the estimated failure rates identified in Table

3.2-2, approximately 6.4 explosive ordnance items would be expected to fail and end up as undetonated ordnance on the ocean floor. Ordnance would be expended across 20 percent of the TMAA, which would result in approximately 0.0007 undetonated explosive items per nm^2 or one undetonated explosive item per 1,430 nm^2. Undetonated ordnance would sink quickly to the ocean floor, where it would corrode, become encrusted by benthic organisms, and be buried through sedimentation.

Undetonated ordnance on the ocean floor could pose a risk to fishermen, particularly bottom trawlers. If a trawl were to contact an undetonated ordnance item, it could trigger a detonation. Most likely, the ordnance would not detonate because it had failed to detonate upon impact with a training target or the water surface. While fishermen could contact undetonated ordnance, it would be unlikely given the large area of the TMAA.

Chaff

Under Alternative 1, there would be no increase in the annual amount of chaff used during training activities from the No Action Alternative. Thus, the impacts of chaff used during training activities under Alternative 1 would be the same as described under the No Action Alternative.

NSW Activities

Alternative 1 would include all NSW training activities described under the No Action Alternative. There would be no increase in NSW activities under Alternative 1. Thus, the impacts of NSW training activities under Alternative 1 are the same as described under the No Action Alternative and would be negligible.

Aircraft Overflights

Under Alternative 1, there would be an increase in overflights from the TMAA to the Alaska inland training areas via the ALTRV. Safety procedures for participants using the ALTRV would remain consistent. Public safety would not be affected by the increase in overflights because of the light air traffic in the GOA and coordination between the Navy and the FAA.

ASW Activities

Sonar

ASW activities within the TMAA would use active sonar. The effect of sonar on humans varies with the frequency of sonar involved. Of the three types of sonar (high-, mid-, and low-frequency), mid-frequency and low-frequency have the greatest potential to affect humans. NAVSEAINST 3150.2 is the Navy's governing document for human divers in relation to active sonar systems; it provides procedures for calculating safe distances from active sonars. For example, a diver wearing a wetsuit without a hood has a permissible exposure limit of 71 minutes at a distance of 1,000 yards from the Navy's most powerful sonar. At this distance, the sound pressure level would be approximately 190 decibels (dB). At 2,000 yards, or approximately 1 nm, a diver could operate for over 3 hours. Exposure to sonar in excess of 190 dB could cause slight visual-field shifts, fogging of the faceplate, spraying of water within the mask, and general ear discomfort. (DoN 2005). Under Alternative 1, sonar could affect nonparticipants in the water nearby. However, nonparticipants in the water would not be expected in the TMAA because of the temperature of the water, the Navy safety procedures prior to training activities, and the distance from shore to the areas where ASW activities would take place. If nonparticipants were present in the training area, Navy safety procedures would delay training until nonparticipants were cleared from the range. The training area would be constantly monitored for nonparticipants during training activities that use sonar.

Sonobuoys

ASW exercises would introduce the use of sonobuoys in the TMAA. Although extremely rare, some solid training items expended at sea could migrate to the shoreline where the public could encounter them.

Included among these items are targets and sonobuoys. Targets typically would be recovered after each use. However, expendable targets such as the MK-39 Expendable Mobile Anti-Submarine Warfare Training Target (EMATT) would not be recovered. MK-39 EMATTs and sonobuoys are designed to scuttle and sink either when commanded, or when their service life has expired, no greater than 8 hours after being deployed. If either an EMATT or a sonobuoy migrated to shore, they would pose little risk to the public. Sonobuoys contain no fuel, the batteries would have lost all power, and the materials used in their construction are inert or sealed in hard plastic casings. Section 3.2, Expended Materials, discusses the hazardous materials and environmental effects of sonobuoys.

One type of sonobuoy, the EER sonobuoy, has explosive charges used to generate acoustic energy in the water. At-sea explosions would cause acoustic pressure, which could harm nonparticipants in the water nearby. Nonparticipants in the water would not be expected because of Navy safety procedures prior to training exercises. If nonparticipants were present in the training area, Navy safety procedures would delay training until nonparticipants were cleared from the range. The training area would be constantly monitored for nonparticipants during training for activities that use ordnance. This sonobuoy would present a hazard if it failed to detonate and washed ashore. These sonobuoys would be used far out to sea, however, and have several redundancies built in to assure that the charges detonate when the sonobuoy is scuttled. Management of expended materials (including hazardous materials) in conjunction with U.S. Navy training activities is addressed in Section 3.2, Expended Materials. No substantial releases of these materials to the environment are anticipated.

Portable Undersea Tracking Range (PUTR)

Alternative 1 would include the use of a Portable Undersea Tracking Range (PUTR). The PUTR requires the temporary placement of seven electronics packages on the seafloor, each approximately 3 feet (ft) (0.9 meters [m]) long by 2 ft (0.6 m) in diameter. No specific locations have yet been identified, but the electronic packages would be placed in water depths greater than 600 ft (182 m), at least 3 nm (5.5 km) from land. This is a temporary installation (to be recovered once training is complete), so no formally restricted areas would be designated and no limitations would be placed on commercial or civilian use of the area. The presence of the PUTR on the ocean floor for the duration of the training exercise would have no effect on public safety because – other than fishing trawls – these areas are not used by the public.

3.14.2.5 Alternative 2

Alternative 2, the Preferred Alternative, would include all elements of Alternative 1 (accommodating training activities currently conducted, increasing training activities, accommodating force structure changes, and conducting ASW activities with the use of active sonar). In addition, training tempo for all activities would be increased 100 percent over levels identified in Alternative 1 (see Table 2-7).

Training Area Clearance

With the exception of SINKEX, no new training exercises would be conducted. The safety procedures implemented under Alternative 2 would be the same as those described under the No Action Alternative. These safety procedures would substantially decrease the likelihood that Navy training in the TMAA would affect public safety. The remoteness of the TMAA, the use of temporary access restrictions, and public notification procedures would substantially reduce potential safety risks during these activities. Therefore, effects on public safety under Alternative 2 would be similar to those under Alternative 1.

Undetonated Ordnance

Under Alternative 2, approximately 1,194 explosive ordnance items would be used during training exercises (see Table 3.6-7 for types of ordnance). The number of explosive ordnance items, however,

accounts for explosive ordnance used during SINKEX training (approximately 858 explosive ordnance items). This section addresses undetonated ordnance for all training activities except SINKEX; undetonated ordnance for SINKEX will be addressed in the next section.

Based on the estimated failure rates identified in Table 3.2-2, approximately 13.5 explosive ordnance items would be expected to fail and end up as undetonated ordnance on the ocean floor. Ordnance would be expended across 20 percent of the TMAA, which would result in approximately 0.002 undetonated explosive items per nm^2 or one undetonated explosive item per 500 nm^2. Undetonated ordnance would sink quickly to the ocean floor, where it would corrode, become encrusted by benthic organisms, and be buried by sediments. Effects on public safety would be the same as described under Alternative 1.

Chaff

Under Alternative 2, the annual amount of chaff used during training activities would increase to 1,080 pounds from 540 pounds under the No Action Alternative. The increase in chaff would not be expected to adversely affect public safety because of coordination with FAA. Chaff would be dispersed upon deployment, and would not be expected gather in concentrations high enough to affect communication or radar systems.

NSW Activities

NSW activities proposed under Alternative 2 would be the same as those described under Alternative 1. Safety procedures as described under Alternative 1 would ensure that nonparticipants were not endangered.

ASW Activities

ASW activities proposed under Alternative 2 would be the same as those described under Alternative 1. Safety procedures as described under Alternative 1 would ensure that nonparticipants were not endangered.

Sinking Exercise

Alternative 2 would include two SINKEX. A single SINKEX would be conducted once per summertime training exercise. During a SINKEX, a decommissioned surface ship is towed to a deep-water location and sunk using a variety of ordnance. The use of live ordnance could affect public safety, but a SINKEX would occur, by rule, at least 50 nm (93 km) offshore. Public use of waters at least 50 nm (93 km) offshore would be infrequent. Navy clearance measures for live-fire training exercises would be implemented, which would greatly decrease the chance that nonparticipants would be in the training area during SINKEX. Therefore, SINKEX would not affect public safety because of the implemented range clearance measures and remoteness of the location.

Approximately 858 explosive ordnance items would be used during two SINKEX training activities per year. Based on the estimated failure rates identified in Table 3.2-2, approximately 40 explosive ordnance items would be expected to fail and end up as undetonated ordnance on the ocean floor. Most of the undetonated ordnance would be Naval gun shells, which accounts for about 93 percent of expended ordnance during SINKEX. SINKEX would occur in a small area, approximately 8 nm^2, resulting in a high density of expended materials relative to other training events. SINKEX would result in approximately 2.5 undetonated explosive items per nm^2. Undetonated ordnance would sink quickly to the ocean floor, where it would corrode, become encrusted by benthic organisms, and be buried through sedimentation. The high density of undetonated ordnance during SINKEX events would not affect public safety because undetonated ordnance would fall near the sunken ship hulk. The sunken ship hulk would be identified as a hazard to navigation on navigational charts, and bottom trawl fishing would not be expected in the vicinity of the ship hulk.

3.14.3 Mitigation

No substantial impacts have been identified. The safety procedures followed by the Navy lower the risk that Navy training activities pose on public safety. No further mitigation measures would be required.

3.14.4 Summary of Effects

Table 3.14-2 summarizes the effects of the No Action Alternative, Alternative 1, and Alternative 2 on public safety under both NEPA and EO 12114.

Table 3.14-2: Summary of Effects by Alternative

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
No Action Alternative	• Current Navy activities were considered and are consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on public safety would occur. • Aircraft overflights would not affect public safety because aircraft are limited to flying within the ALTRV and follow FAA guidelines.	• Navy training exercises in the TMAA will not affect public safety. The Navy will issue NOTAMs or NOTMARs to notify the public of training exercises. If non-participants are in the training area, training activities will not proceed until non-participants have left the area.
Alternative 1	• Under Alternative 1, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on public safety would occur. • Increase in aircraft overflights would not affect public safety because aircraft are limited to flying within the ALTRV and follow FAA guidelines.	• Navy training exercises in the TMAA will not affect public safety. The Navy will issue NOTAMs or NOTMARs to notify the public of training exercises. If non-participants are in the training area, training activities will not proceed until non-participants have left the area. • Impacts on public safety would be the same as under the No Action Alternative. • Installation and use of the temporary PUTR will not affect public health or safety.

Table 3.14-2: Summary of Effects by Alternative (continued)

Alternative	NEPA (U.S. Territorial Seas, 0 to 12 nm)	EO 12114 (Non-U.S. Territorial Seas, > 12 nm)
Alternative 2 (Preferred Alternative)	• Under Alternative 2, Navy activities were considered and would be consistent with those analyzed in the previous environmental documentation (USAF 1995, USAF 2007, Army 1999, Army 2004). These documents concluded that no significant impacts on public safety would occur. • Increase in aircraft overflights would not affect public safety because aircraft are limited to flying within the ALTRV and follow FAA guidelines.	• Navy training exercises in the TMAA will not affect public safety. The Navy will issue NOTAMs or NOTMARs to notify the public of training exercises. If non-participants are in the training area, training activities will not proceed until non-participants have left the area. • There would be an increase in training tempo and new training activities, but impacts on public safety would be the same as under the No Action Alternative and Alternative 1. • With implementation of SOPs, range clearance procedures, and NOTMARs, SINKEX will not affect public health or safety.

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4 Cumulative Impacts

4 CUMULATIVE IMPACTS

4.1 PRINCIPLES OF CUMULATIVE IMPACTS ANALYSIS

The approach taken herein to analyze cumulative effects[1] meets the objectives of the National Environmental Policy Act (NEPA) of 1969, Council on Environmental Quality (CEQ) regulations, and CEQ guidance. CEQ regulations (40 Code of Federal Regulations [C.F.R.] §§ 1500-1508) provide the implementing procedures for NEPA. The regulations define "cumulative effects" as:

> ". . . the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 C.F.R. 1508.7).

CEQ provides guidance on cumulative impacts analysis in *Considering Cumulative Effects Under the National Environmental Policy Act* (CEQ 1997). This guidance further identifies cumulative effects as those environmental effects resulting "from spatial and temporal crowding of environmental perturbations. The effects of human activities will accumulate when a second perturbation occurs at a site before the ecosystem can fully rebound from the effects of the first perturbation." Noting that environmental impacts result from a diversity of sources and processes, this CEQ guidance observes that "no universally accepted framework for cumulative effects analysis exists," while noting that certain general principles have gained acceptance. One such principal provides that "cumulative effects analysis should be conducted within the context of resource, ecosystem, and community thresholds—levels of stress beyond which the desired condition degrades." Thus, "each resource, ecosystem, and human community must be analyzed in terms of its ability to accommodate additional effects, based on its own time and space parameters." Therefore, cumulative effects analysis normally will encompass geographic boundaries beyond the immediate area of the Proposed Action, and a time frame including past actions and foreseeable future actions, to capture these additional effects. Bounding the cumulative effects analysis is a complex undertaking, appropriately limited by practical considerations. Thus, CEQ guidelines observe, "[i]t is not practical to analyze cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful."

For the Proposed Action to have a cumulatively significant impact on an environmental resource, two conditions must be met. First, the combined effects of all identified past, present, and reasonably foreseeable projects, activities, and processes on a resource, including the effects of the Proposed Action, must be significant. Secondly, the Proposed Action must make a substantial contribution to that significant cumulative impact. Finally, if the effects of the Proposed Action alone would have a significant impact on an environmental resource within its Region of Influence, then the impacts of the Proposed Action in combination with all other past, present, and reasonably foreseeable actions would normally be cumulatively significant.

4.1.1 Identifying Geographical Boundaries for Cumulative Impacts Analysis

Geographic boundaries for analyses of cumulative impacts can vary for different resources and environmental media. For air quality, the potentially affected air quality regions are the appropriate boundaries for assessment of cumulative impacts from releases of pollutants into the atmosphere. For wide-ranging or migratory wildlife, specifically marine mammals, sea turtles, fish, and sea birds, any impacts of the Proposed Action might combine with the impacts of other activities or processes within the range of the population. Due to the relatively remote location of the Proposed Action and limited

[1] CEQ Regulations provide that the terms "cumulative impacts" and "cumulative effects" are synonymous (40 C.F.R. § 1508.8[b]).

Department of Defense (DoD) and commercial project activity, the geographic boundary for the majority of resources analyzed for cumulative impacts in this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) is the Gulf of Alaska (GOA). However, migratory wildlife are analyzed for cumulative impacts based on the ecological ranges of their populations.

Activities taking place in areas inland from the coastline, including United States (U.S.) Air Force (Air Force) air ranges and U.S. Army (Army) training lands, are addressed in the *Alaska Military Operations Area EIS* (USAF 1995), *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007), the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999), and the *Transformation of U.S. Army Alaska FEIS* (Army 2004). These documents are independent of Navy GOA activities discussed in this EIS/OEIS. The nature and extent of training on Air Force and Army inland training lands has not changed substantially during the past five years, and is not expected to change substantially in the foreseeable future with the exception of the United States Army Alaska [USARAK] Stationing and Training of Increased Aviation Assets. An EIS prepared for the U.S. Army, *Alaska Stationing and Training of Increased Aviation Assets,* analyzed the impact of increasing personnel and aircraft (Army 2009). The result of this analysis is included in the consolidated list of past, present, and reasonably foreseeable future projects in the GOA (Table 4-1).

4.1.2 Projects and Other Activities Analyzed for Cumulative Impacts

4.1.2.1 Past, Present, and Reasonably Foreseeable Future Actions

Identifiable present effects of past actions are analyzed, to the extent they may be additive to impacts of the Proposed Action. In general, the Navy lists and analyzes the effects of individual past actions only where appropriate; cumulative impacts analysis typically focuses on aggregate effects of past actions. This analysis depends on the availability of data and the relevancy of future effects of past, present, and future actions. Although certain data (e.g., extent of forest cover) may be available for extensive periods in the past (i.e., decades), other data (e.g., water quality) may be available only for much shorter periods. Because specific information and data on past projects and actions are usually scarce, the analysis of past effects is often qualitative (CEQ 1997). Analysis will primarily include present and reasonably foreseeable future actions that may have effects additive to the effects of the Proposed Action. These actions include all likely future development of the region even when foreseeable future action is not planned in sufficient detail to permit complete analysis (CEQ 1997). Table 4-1 lists past, present, and reasonably foreseeable projects with the potential to contribute to cumulative impacts.

Table 4-1: Past, Present, and Reasonably Foreseeable Future Projects in the GOA

Project	Project Description	Project Timeframe		
		Past	Present	Future
Alaska Groundfish Harvest Specifications EIS	FEIS to cover the establishment of harvest strategies for the Bering Sea and Aleutian Islands and GOA groundfish fisheries. Final EIS Record of Decision (ROD) signed 2007. The lead agency on this EIS was National Marine Fisheries Service (NMFS).	X	X	X
Alaska Groundfish Fisheries EIS	FEIS for the Fishery Management Plans for groundfish fishery of the GOA and the groundfish fishery of the Bering Sea and Aleutian Islands Area, North Pacific Fishery Management Council. Final Supplemental EIS ROD signed 2004. The lead agency on this EIS was NMFS.	X	X	X

Table 4-1: Past, Present, and Reasonably Foreseeable Future Projects in the GOA (continued)

Project	Project Description	Project Timeframe		
		Past	Present	Future
Alaska Predator Ecosystem Experiment (APEX)	The APEX was initiated under Restoration Project 94163, entitled *Forage Fish Influence on Recovery of Injured Species*. This pilot project was an interdisciplinary and interagency study (from Federal, state, private, and university entities) designed to investigate prey (forage fish) distribution, abundance, and availability. The multi-year project incorporated a group of existing bird and forage fish investigations and proposals within the Prince William Sound, Cook Inlet, and northern Gulf of Alaska to provide an integrated research approach that examined the interactions of seabirds and their prey, the reasons that changes in prey might have occurred, and the consequences for seabirds. The last year in the field for APEX was 1999, followed by a year of data analysis and production of publications.	X		
Amendments to the Alaska Coastal Management Program, Approval, Implementation and Funding, US Army COE 404 Permit, AK	The proposed Federal action is the Office of Ocean and Coastal Resource Management's (OCRM) review and approval of Alaska's request to incorporate Executive Order 106, House Bills 191, 69, and 86, Senate Bill 102, revisions to the statute AS 46, and new implementing regulations at 11 AAC 110, 11 AAC 112, and 11 AAC 114 as amendments to the Alaska Coastal Management Program (ACMP) pursuant to OCRM regulations on Amendments to Approved Management Programs (15 C.F.R. part 923, subpart H). When an amendment is submitted, OCRM must review the request to determine if the federally-approved management program, as changed by the amendment request, will still constitute an approvable program.	X	X	X
Commercially Guided Helicopter Skiing on the Kenai, Peninsula EIS	FEIS issuance of a special use permit allowing guided heli-skiing operations on portions of the Glacier and Seward Ranger Districts, Chugach National Forest, Glacier and Seward Ranger Districts, Kenai Peninsula. Final ROD signed 2002. The lead agency on this EIS was the United States Forest Service.	X	X	
Cook Inlet Beluga Whale Subsistence Harvest-Supplemental EIS	NMFS proposes to implement a long-term plan to manage subsistence harvests of the Cook Inlet, Alaska, beluga whale stock (*Delphinapterus leucas).* Also proposes to implement a Long-Term Harvest Plan and Fulfill the Federal Government's Trust Responsibility, Cook Inlet, AK Final ROD signed 2008. The lead agency on this EIS was NMFS.	X	X	X
EFH Identification and Conservation, Implementation, North Pacific Fishery Management Council, MSFCMA	The Magnuson-Stevens Act defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The National Marine Fisheries Service (NMFS) and regional Fishery Management Councils (Councils) have described and identified EFH in fishery management plans (FMPs), minimized the adverse effects of fishing on EFH, and identified other actions to encourage the conservation and enhancement of EFH.	X	X	X

Table 4-1: Past, Present, and Reasonably Foreseeable Future Projects in the GOA (continued)

Project	Project Description	Project Timeframe		
		Past	Present	Future
Exxon Valdez Oil Spill Restoration Plan-Draft Supplemental EIS	NOAA, as a member of the Exxon Valdez Oil Spill Trustee Council, is preparing a supplement to the existing environmental impact statement (EIS) on the Council's restoration efforts. The supplemental EIS assesses the environmental impacts of the Council's proposal to narrow and refine the scope of the Council's restoration efforts to five defined restoration categories: herring; lingering oil; longterm monitoring of marine conditions; harbor protection and marine restoration; and habitat acquisition and protection. Draft published June 2010.			X
Gulf Apex Predator-Prey (GAP) Project	Initiated in 1999 through a NOAA grant, GAP's primary goal is to document trophic relationships between Steller sea lions, their prey, predators, and potential competitors in waters near Kodiak Island, an area of continued sea lion declines and extensive commercial fishing. From 2001-2003 GAP studies indirectly tested the hypothesis that Steller sea lions are prey-limited by documenting a) sea lion prey; b) the abundance, distribution, and quality of those prey species; and c) the productivity and health of other consumers of the same prey. GAP studies also collected baseline data for predation by killer whales or sharks. Additionally, by simultaneously monitoring environmental and oceanographic parameters over time in this area, GAP researchers tested the hypothesis that environmental and oceanographic change affects Steller sea lions, their prey, predators, and potential competitors. Funding from National Marine Fisheries Service (NMFS) in Fiscal Year (FY) 02 provided continued support of GAP's long-term goals and objectives. The final report was published in 2005.	X		
Helicopter Access to Conduct Forest Inventory and Analysis (FIA) in Wilderness FEIS	The USDA Forest Service proposes to authorize the use of helicopters to access FIA plots within the wilderness areas of the Tongass National Forest and a wilderness study area on the Chugach National Forest. This FEIS describes five action alternatives, including the Proposed Action, and the No Action alternative. There are a total of 913 plots that were inventoried over a ten-year period. The Proposed Action authorizes helicopter access to 540 plots. The significant issues identified are effects to wilderness character, wildlife, and employee safety. ROD signed in 2007.	X	X	X
Surveillance Towed Array Sensor System Low Frequency Active (SURTASS LFA) Sonar	Final Supplemental Environmental Impact Statement (SEIS) for the employment of the SURTASS LFA system was issued in April 2007, and the Record of Decision (ROD) was issued in August 2007 by the Navy. Under the action, a maximum of four systems would be deployed in the Pacific-Indian ocean area and in the Atlantic-Mediterranean area. Of an estimated maximum 294 underway days per year, the SURTASS LFA sonar would be operated in the active mode about 240 days.	X	X	X

Table 4-1: Past, Present, and Reasonably Foreseeable Future Projects in the GOA (continued)

Project	Project Description	Project Timeframe		
		Past	Present	Future
Naval Special Warfare Maritime Training Activities – Kodiak Island	Navy Special Warfare Command currently conducts training exercises on and around Kodiak Island. Training consists of SEAL Qualification Training (SQT) approximately six times a year, SEAL Team training approximately twice a year; and parachute operations once every two years. The USFWS concluded that the exercises are not likely to adversely affect listed species or adversely modify critical habitat.	X	X	X
Joint Pacific Alaska Range Complex Modernization and Enhancement EIS	The Army and Air Force, through Alaskan Command, are proposing to modernize and enhance the Joint Pacific Alaska Range Complex (JPARC) to enable realistic joint training for the Army, Navy, Marine Corps, and Air Force. The JPARC Modernization and Enhancement EIS will analyze potential environmental consequences associated with expanding and/or establishing new Military Operations Areas, restricted airspace, airspace corridors, ground maneuver training areas, and training complexes. The Notice of Intent to prepare the EIS was published in the Federal Register on December 10, 2010. The EIS is currently in the initial scoping stage.		X	X
Knik Arm Crossing (KAC)	The KAC is a proposed bridge by the Knik Arm Bridge and Toll Authority to enhance access between the Municipality of Anchorage and the Matanuska-Susitna Borough (Mat Su) to the northwest. The project sponsor is the Knik Arm Bridge and Toll Authority, a public corporation established by the Alaska State Legislature in 2003 to undertake the permitting, design, financing, construction, and operation of the KAC as a toll road. The bridge crossing could be 8,000 to 14,000 feet long over Knik Arm. The Federal Highway Administration (FHWA), in coordination with the Alaska Department of Transportation and Public Facilities, prepared an EIS addressing the proposal and alternatives (*Knik Arm Crossing Final EIS: FHWA, Dec. 2007*). A request from the Knik Arm Bridge Toll Authority has been submitted to NOAA (75 FR 54599, September 8, 2010) for authorization to take marine mammals incidental to construction over the course of five construction seasons (spring 2013 through autumn 2017). A Record of Decision (ROD) was issued on December 8, 2010.			X
Kodiak National Wildlife Refuge, Draft Revised Comprehensive Conservation Plan, Implementation	The Comprehensive Conservation Plan and EIS was prepared by U.S. Fish and Wildlife Service Region 7, Anchorage and released in 2004. The plan provides management direction for activities and uses of Kodiak Refuge, goals and objectives for refuge programs, and compatibility determinations for the current uses of the Kodiak National Wildlife Refuge. The revised plan and EIS ROD was signed in 2006.	X	X	X
Port MacKenzie Development	Mat Su Borough has been planning to build a deep-water dock facility in the Point MacKenzie area, to facilitate economic development in the borough, for about 30 years. A barge dock was completed in 2000, and a deep-water dock was completed in 2005. In addition to potentially increasing vessel traffic in the Anchorage area, the project could encourage further economic and land development activity.	X	X	X

Table 4-1: Past, Present, and Reasonably Foreseeable Future Projects in the GOA (continued)

Project	Project Description	Project Timeframe		
		Past	Present	Future
Port of Anchorage Expansion	The Port of Anchorage plays a major role in the regional economy, accommodating approximately 75 percent of goods shipped into Alaska. The Port is planning a major expansion of its marine terminal capacity, including road and rail service expansion and redevelopment of the marine terminal. The contracts for initial berth expansion were awarded in early 2008, and construction is projected to occur through 2012 (Port of Anchorage 2008). The expansion project could potentially increase vessel traffic to and from the GOA.		X	X
Ferry Service for Knik Arm	The Mat Su Borough is developing a ferry link between Port MacKenzie and the Port of Anchorage. The Cook Inlet Ferry is expected to begin operation in summer 2010, accommodating foot passengers, tractor-trailers, and automobiles. Parking facilities and ferry landings are planned on both sides of Knik Arm. While not directly influencing the GOA, the project could increase vessel traffic in the Cook Inlet/Knik Arm area.			X
Ring of Fire Resource Management Plan, Implementation RMP/EIS	The Bureau of Land Management (BLM) prepared a Proposed Resource Management Plan/Final Environmental Impact Statement (PRMP/FEIS) to provide direction for managing their public lands within the Ring of Fire planning area boundaries, and to analyze the environmental effects that would result from implementing the alternatives presented in the PRMP/FEIS. The ROD was signed in 2008.	X	X	X
USARAK Stationing and Training of Increased Aviation Assets	The U.S. Army, Alaska is proceeding with implementing a proposal to reorganize and augments its aviation assets in Alaska as an Aviation Task Force (ATF). The ATF is permanently stationed at Fort Wainwright. New facilities will be constructed and the total growth will be approximately 2,005 soldiers, family members, and civilian support personnel. The EIS and ROD were completed in 2009.	X	X	X
U.S. Army Alaska Battle Area Complex (BAX) and a Combined Arms Collective Training Facility (CACTF), Construction and Operation	U.S. Army Alaska Battle Area Complex (BAX) and a Combined Arms Collective Training Facility (CACTF), The Army completed an EIS and ROD for construction and operation of a BAX and CACTF to be located at Eddy Drop Zone. The ROD was issued in July 2006. The Eddy site is located almost immediately east of Fort Greely and southeast of Delta Junction. The location is predominately upland habitat but the area where the BAX would be situated also lies within the 100-year floodplain of Jarvis Creek. The CACTF site rests about four miles from Delta Junction, and the BAX approximately five miles. The design of the BAX orients weapons firing to the south, away from Delta Junction.	X	X	X
Other Potential Coastal Development	Various commercial, industrial, transportation, and residential development is possible in the coastal areas of Alaska. Mat Su Borough, for example, has discussed building a road/rail connection to Willow; a 200-megawatt (MW) gas-fired power plant has been discussed for Mat Su Borough; residential development has been proposed near various lakes in Mat Su; and assorted growth and development proposals are regularly raised for the greater Anchorage area. These potential coastal developments may gradually reduce terrestrial habitat acreage and introduce pollutants that are associated with urbanization into the air and water.			X

Table 4-1: Past, Present, and Reasonably Foreseeable Future Projects in the GOA (continued)

Project	Project Description	Project Timeframe		
		Past	Present	Future
Alaska Aerospace Corporation Space Vehicle and Missile Launch Operations at Kodiak Launch Complex	Alaska Aerospace Corporation launches space launch vehicles, long-range ballistic target missiles, and other smaller missile systems at the Kodiak Launch Complex. It is currently seeking authorization from NMFS to take small numbers of marine mammals incidental to the activities for the period of February 2011 through February 2016. This facility occupies 3,717 acres of state-owned lands on the Narrow Cape Peninsula on the eastern side of Kodiak Island, Alaska, approximately 22 miles from the city of Kodiak.		X	X

4.1.3 Other Regional Activities, Processes, and Trends

In addition to analyzing those past, present, and planned future projects listed in Table 4-1, a description follows of other activities that were also considered in the cumulative impact analysis.

4.1.3.1 Fishing

Commercial fishing is by far the predominant human activity in the GOA, although a number of fisheries are at very depressed levels or are closed (Richardson and Erickson 2005). Four major commercial fisheries are located in the GOA and vicinity: the groundfish, Pacific halibut, salmon, and scallop fisheries. Several other fisheries occur in the GOA (e.g., Pacific herring, clam, crab, shrimp, sea cucumber, sea urchin, and abalone) in Alaskan State waters (Ashe et al. 2005, Sagalkin 2005, Berceli and Trowbridge 2006, Trowbridge and Goldman 2006). Commercial fisheries that occur in federal waters off southern Alaska are described below. Some of these fisheries are managed federally (by the NMFS and North Pacific Fishery Management Council [NPFMC]), some have their management activities deferred to the State level (Alaska Department of Fish and Game [ADF&G]), and others are jointly managed at the state, federal, or international levels.

The most important commercial fisheries in the GOA are groundfish fisheries. Groundfish species harvested in the GOA include "target species" such as walleye pollock, Pacific cod, sablefish, Atka mackerel, several species of flatfish and rockfish, and skates. In 2007, the Central regulatory area yielded 71,210 metric tons of groundfish, which equaled approximately 54 percent of the total groundfish catch for the entire GOA. The GOA continental shelf and slope, particularly the wide shelf and banks around Kodiak Island, support a large biomass of groundfish. Groundfish fisheries in the GOA were developed in the late 1970s, and have become a major source of food and income for residents of Alaska, Washington, and Oregon. In addition to groundfish, a number of "other species" are caught, including squids, octopi, sharks, and sculpins. These species are of lesser economic value, and are generally not targeted. Groundfish are often harvested in multispecies complexes, as it is common for several species to be caught at the same time. The groundfish fishery is a complex industry, in that it is conducted across a wide range of habitats using an assortment of fishing gears, including trawls, hook-and-line gear, and pots. In 2002, 824 vessels participated in the groundfish fisheries in the GOA. Of these, 642 were hook-and-line vessels, 131 were pot vessels, and 123 were trawl vessels (NPFMC 2009).

Commercial fisheries for Pacific halibut are managed by a treaty between the United States (U.S.) and Canada, and through recommendations of the International Pacific Halibut Commission (IPHC). Pacific halibut is considered as one large interrelated biological stock, although it is regulated by subareas through catch quotas, time-area closures, and since 1995 in Alaska, by an individual fishing quota (IFQ)

program adopted by the NPFMC and implemented by the NMFS. Commercial catch limits in the GOA, located in IPHC Regulatory Area 3A, are higher than those in other areas of the eastern North Pacific because those waters are believed to be the center of Pacific halibut abundance (United States Department of Commerce, National Oceanic and Atmospheric Administration 2005 [USDC, NOAA]) (See Figure 3.6-1).

Pacific salmon support numerous commercial, recreational, and subsistence fisheries in Alaskan State waters. All five species of Alaska salmon (chinook, chum, coho, pink, and sockeye) are fully utilized, and stocks in most regions of the State generally have been rebuilt to, or beyond, previous high levels (Clark et al. 2006). Pink and sockeye salmon are the most abundant species in catches in the GOA (Eggers 2004).

Scallop fisheries in the GOA are relatively small compared to the region's groundfish, halibut, and salmon fisheries. As discussed in Section 3.12.1.1 (Socioeconomics), a major scallop bed in the GOA is located off the coast of Kodiak Island. Individual catch data for the Kodiak beds are not maintained; however the ADF&G states that, between 1998 and 2002, one of the largest harvests came from the Kodiak area averaging 82 metric tons each year (Woodby et al. 2005). The weathervane scallop is the only commercially exploited scallop stock in the GOA. Weathervane scallop populations were first evaluated for commercial potential in the early 1950s, but it was not until the late 1960s that interest in a fishery off Alaska took shape. Initial commercial fishing effort took place in 1967, when two vessels harvested weathervane scallops from fishing grounds off the east side of Kodiak Island. By the following year, 19 vessels had entered the fishery. Since then, vessel participation and harvests have fluctuated greatly, but have remained below the peak levels experienced in the late 1960s (NPFMC 2005b). All commercial fisheries for scallops take place in the relatively shallow waters of the continental shelf.

Data on recreational and subsistence fishing in the GOA are limited (Richardson and Erickson 2005). Recreational fishing mainly occurs off southeastern Alaska and along the northern Gulf of Alaska coast, including Prince William Sound, Kenai Peninsula, Cook Inlet, and Kodiak Island (Squire and Smith 1977). Fishing derbies for salmon and halibut are regularly held in Seward, Cordova, Homer, and Valdez. Sportfishing charters also routinely operate out of each of these ports. Subsistence fishing primarily occurs in coastal areas to the west and north that are relatively inaccessible to most recreational anglers. Nearly all recreational and subsistence fishing activities occur in State waters, as rough waters are a limiting factor further offshore (Squire and Smith 1977; NPFMC 1990, 2005b; USDC, NOAA 2005). As a result, minimal recreational and subsistence fishing activities are expected within the TMAA.

Commercial fishing can affect fish habitat and managed species. Potential effects of commercial fishing include over-fishing of targeted species and by-catch, both of which affect fish stocks. Mobile fishing gears such as bottom trawls disturb the seafloor and reduce structural complexity. Indirect effects of trawls include increased turbidity, alteration of surface sediment, removal of prey (leading to declines in predator abundance), removal of predators, ghost fishing (i.e., lost fishing gear continuing to ensnare fish and other marine animals), and generation of marine debris. Lost gill nets, purse seines, and long-lines may foul and disrupt bottom habitats. Recreational fishing could affect fish habitats because of the large number of participants and the intense, concentrated use of specific habitats. Other indirect environmental effects of fishing include water pollution, air pollution from vessel engine exhaust, vessel transit noise, and vessel maintenance, which generates solid and hazardous wastes.

Commercial fishing in Alaska, including the GOA, appears to be a mature industry, with year-to-year variations in total landings of particular species, but no substantial increases in overall landings of commercial fish and other seafood (NMFS 2004, NOAA 2009). The overall numbers of fishing vessels engaged in major commercial fisheries and commercial fishing licenses in Alaska both have declined substantially in the past 8 years (State of Alaska Commercial Fisheries Entry Commission 2008). On the

basis of these trends, the level of commercial fishing in the GOA is not expected to increase substantially in the foreseeable future.

4.1.3.2 Commercial and Recreational Marine Traffic

A substantial amount of ocean traffic, consisting of both large and small vessels, transits through the GOA. Vessel traffic in the GOA includes tankers, container ships, roll-on roll-off cargo ships, ferries, fishing boats, cruise ships, military and scientific vessels, whale-watching boats, and recreational watercraft of various sizes and uses. A substantial volume of small craft traffic, primarily recreational, occurs throughout the inland waters of the GOA. Inland waters surrounding the GOA offer other recreational activities, such as kayaking and rafting. Sportfishing is also popular (Outdoor Directory 2008).

Cruise travel along the GOA is a popular recreational activity, and is the fastest growing tourist trade (City Data 2008). With excellent fishing and stunning coastal scenery, many visitors to the GOA choose to tour the area by boat and can choose from single-day to multiday cruises (Travel Alaska 2008).

In addition to large commercial vessels traversing the GOA, the Alaska Marine Highway System (AMHS) provides ferry service for passengers and vehicles between coastal communities (AMHS 2007). The Southwest Alaska route services Prince William Sound, Kodiak Island, the Alaska Peninsula, and the Aleutian Islands. The ferry route closest to the GOA is in Chenega Bay in the Prince William Sound and the town of Kodiak on Kodiak Island. The route is one of the least busy routes, with only 12 sailings in 2007 (AMHS 2007).

Two major ports close to the GOA, Anchorage and Valdez, were ranked in the top 150 U.S. ports by tonnage in 2000 (Research and Innovative Technology Administration/Bureau of Transportation Statistics [RITA/BTS] 2001). Commercially used waterways traverse the GOA, but are controlled by the use of directional shipping lanes for large vessels (cargo, container ships, and tankers). Ships traveling from major ports to the Lower 48 states and Hawaii, as well as marine traffic between coastal ports, enter the GOA briefly, but Navy activities are communicated to all vessels and operators by use of Notices to Mariners (NOTMARs).

Commercial vessels are sources of pollutants introduced into the water and air of the GOA. Additionally, commercial vessels are a source of transient noise, affecting the acoustic environment. Finally, commercial vessels are a source of ship strikes to marine mammals, and are implicated in many ship strikes in the GOA. Pleasure boats are sources of fuel leaks and toxins from antifouling paints (National Marine Manufacturers Association [no date], Nichols 1988).

The volumes of commercial and recreational vessel traffic in the GOA are closely tied to conditions in mainland Alaska. The population of Alaska is growing (Western Rural Development Center 2008); ferry services and private recreational fishing and boating are likely to grow in proportion to the increase in population. Additionally, cruise ship traffic and other tourism activities such as whale-watching, fishing charters, and other commercial recreational activities in the GOA are expected to increase in response to increasing demand for outdoor recreational experiences in Alaska (U.S. Fish and Wildlife Service 2009). Based on projections for freight shipments through the Port of Anchorage, freight shipments through Alaskan waters, and thus cargo vessel traffic, are expected to grow about 10 percent every five years (Port of Anchorage 2005). Further energy development in Alaska, such as expansion of Arctic oil fields or new oil and gas developments on the outer continental shelf, by encouraging population and economic growth (Institute of Social and Economic Research 2009), will indirectly increase commercial and recreational vessel traffic. On the basis of the trends mentioned above in population, recreation, and industry, the volume of commercial and recreational vessel traffic in the GOA is expected to increase substantially in the future.

4.1.3.3 Ocean Pollution

Water quality in the GOA is generally considered to be pristine because of the low population densities found in the region compared to the large amount of shoreline. Water pollution could result from onshore and offshore oil and gas exploration and production, municipal discharges, mining wastes, timber harvesting, vessel traffic, and fish-processing discharges.

Inland contaminated sites may contribute pollutants to coastal waters through surface water. Possible sources include solid and industrial waste landfills, the open burning of solid waste, active and formerly-used defense sites, and federal, state, and privately owned contamination sites. These sites contain a variety of pollutants, with possible contaminants including persistent organic pollutants (POPs), dioxins, petroleum products, heavy metals, pesticides, and radionuclides. Inland pollutants do not substantially affect the quality of offshore waters in the GOA, however, because pollutants flushed into the ocean are rapidly buried in coastal benthic sediments and upwelling of deep oceanic water in the central GOA diverts surface waters away from this area (Sheppard 2000).

POPs are common at low concentrations in the GOA because their physical and chemical properties allow them to persist for long periods in the Arctic environment. POPs in offshore areas of the GOA result primarily from distant sources because POPs can travel large distances in ocean currents and on surface winds (Sheppard 2000). They persist for long periods in the environment, and bioaccumulate in the food chain, causing health effects in humans and wildlife. Recent sampling of fish in Alaska by ADEC, including from the GOA, however, indicate that concentrations of organic and inorganic contaminants are generally substantially lower than concentrations in fish from other areas (ADEC, no date, Fish Monitoring Program: Analysis of Organic Contaminants; accessed in May 2009). Concentrations of POPs from distant sources are likely to increase in the GOA in the future in response to long-term trends in Pacific Ocean pollution.

Petroleum hydrocarbons may enter the marine environment during exploration, extraction, and transportation of crude oil, natural gas, coal, and coal bed methane resources. Oil may be discharged when it is discovered, during accidental blowouts, and during transportation. Low volumes of oil are continually discharged during the drilling process; drill cuttings and mud, which contain heavy metals and lubricants, are contained in process water that is deposited directly into the marine environment, estuaries, land, or deep injection wells. Process water also may include heavy metals, such as mercury, cadmium, zinc, chromium, and copper. Benthic infauna can be impacted within 15 square kilometers (km^2) of an oil rig due to disposal of water-based muds. The State of Alaska and the federal government are expanding their oil and gas leasing program in Alaska for exploration and extraction to meet the nation's energy demands, but there are no planned leases in either GOA or Kodiak planning areas (Minerals Management Service 2009). After the 20 April 2010 Deepwater Horizon oil rig explosion in the Gulf of Mexico a ban on deepwater drilling was reinstated for six months. The Department of the Interior has stated that it will not decide whether to allow exploration drilling for oil and gas in the Alaska Arctic outer continental shelf until it has completed a review of safety issues relating to offshore drilling activities (DOI 2010).

Marine water quality in the GOA is also affected by air pollution and emissions of greenhouse gases (GHGs). Air pollutants adhere to or are absorbed by water droplets, and are rained out of the atmosphere during precipitation events, which transport these pollutants into the GOA. GHGs, especially CO_2, are absorbed into ocean surface waters and, through downwelling, mixed into deeper waters. Marine waters near the poles have a greater capacity for dissolving carbon dioxide than do waters in the tropics, making them more susceptible to ocean acidification (Congressional Research Service 2009). A study of ocean acidification released in September 2009 indicates, based on monitoring data collected by instrumented buoys, that the acidity of GOA marine waters has increased by about 25 percent from its pre-industrial level (University of Alaska, Fairbanks 2009). Based on current trends in atmospheric GHG concentrations

and the known characteristics of arctic marine waters, the quantities of GHGs absorbed by ocean waters and ocean acidity are expected to increase in the foreseeable future.

Cruise ships are a substantial source of water pollutants because of the large number of passengers and the hazardous wastes generated. For example, a typical cruise ship produces 15 tons of garbage, 170,000 gallons of gray water, 21,000 gallons of sewage, and 5,000 gallons of oil-contaminated water per day (USEPA 2008). The amount of pollutants is similar to a small city, and the cruise industry is expanding. The cruise ship industry in North America has been growing at an annual rate of about five percent, and the future outlook for the industry in Alaska is for continued slow long-term growth.

In 1990, Congress enacted the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 which established a federal program to prevent the introduction and to control the spread of unintentionally introduced aquatic nuisance species and gave the U.S Coast Guard jurisdiction over ballast water management (see Section 3.3). The National Invasive Species Act amended the Nonindigenous Aquatic Nuisance Prevention and Control Act in 1996, which indicated that the DoD was to establish its own ballast water management program for seagoing vessels of the Department of Defense. Additionally, the Clean Water Act was amended in 1996 to allow for the Secretary of the Defense and Administrator of the USEPA to work in consultation with the U.S. Coast Guard and interested states to determine discharges incidental to the normal operation of a vessel of the Armed Forces for which it is reasonable and practicable to require use of a marine pollution control device. The Navy has chosen to voluntarily adopt the intent of the U.S. Coast Guard with respect to ballast water management as it works with USEPA to finalize Uniform National Discharge Standards. Other cruise ships, freighters, and tankers that frequent the GOA are required to comply with the regulations as well.

4.1.3.4 Scientific Research

There are currently scientific research permits and General Authorizations for research issued by the NMFS for cetacean work in the wild in the North Pacific. The most invasive research involves tagging or biopsy, while the remainder focuses on vessel and aerial surveys and close approach for photo-identification. NMFS has also issued General Authorizations for commercial photography of non-listed marine mammals, provided that the activity does not rise to Level A harassment of the animals. These authorizations are usually issued for no more than 1 or 2 years, depending on the project.

The impacts of this type of research are largely unmeasured. However, given the analysis and scrutiny given to permit applications, it is assumed that any adverse effects are largely transitory (e.g., inadvertent harassment, biopsy effects). Data to assess population level effects from research are not available. Even if data were available, it is uncertain that research effects could be separately identified from other adverse effects on cetacean populations. Levels of research-related vessel and aircraft activities in the GOA are assumed to remain relatively unchanged for the foreseeable future.

4.1.3.5 Commercial and General Aviation

Ted Stevens Anchorage International Airport is the primary airport that services the GOA region. Other primary airports in Alaska, but outside of the GOA region, include Fairbanks International Airport, Juneau International Airport, and Ketchikan International Airport. Numerous other commercial and smaller general aviation airports are located throughout the GOA region, and add to the increase in low-altitude traffic.

Private aviation is an important and basic mode of transportation in Alaska because approximately 90 percent of Alaska is not served by roads. Alaska has six times as many pilots per capita and 16 times as many aircraft per capita as the rest of the United States. Aircraft operating under visual flight rules (VFR) can fly along the Alaska coast, largely unconstrained, except by safety requirements and mandated traffic

flow requirements. Aircraft operating under instrument flight rules (IFR) clearances authorized by the FAA normally fly on the airway route structures. These routes include both high- and low-altitude routes between neighboring airports. When Warning Area (W)-612 is active, aircraft on IFR clearances are precluded from entering the Warning Area by the FAA. However, since W-612 is located entirely over international waters, nonparticipating aircraft operating under VFR are not prohibited from entering the area. Examples of aircraft flights of this nature include light aircraft, fish spotters, and whale watchers.

The intensity of commercial air traffic and private aviation in Alaska is expected to increase somewhat in the future (ADEC 2008), due to increases in the resident population (Western Rural Development Center 2008), increased summer tourism (U.S. Fish and Wildlife Service 2009), and increased air cargo shipments (Alaska Department of Labor and Workforce Development 2005).

4.1.3.6 Naval Special Warfare Maritime Training Activities Around Kodiak Island

As part of its training curriculum, the Navy Special Warfare Command currently conducts the following training exercises on and around Kodiak Island:

- SEAL Qualification Training (SQT) approximately six times a year;
- SEAL Team training approximately twice a year; and
- Parachute operations once every two years.

The specific timing of training events varies depending on operational requirements. These training exercises have been reviewed by the USFWS Anchorage Field Office. On January 25th, 2010, the USFWS concurred that the exercises are not likely to adversely affect listed species or adversely modify critical habitat. Training activities conducted as part of the Proposed Action and NSW training around Kodiak Island will not occur together but could coincide in terms of timeframe. Even if these activities did coincide, the potential for cumulative impacts is very low due to the type of activities conducted around Kodiak Island and the lack of spatial overlap (Kodiak Island is over 20 nm from the TMAA) between Kodiak training and Fleet training in the TMAA. Due to the type of activities, their location, and the limited and infrequent nature of NSW activities, these activities would not add cumulatively to the impacts of the Proposed Action.

4.1.4 Habitats of Migratory Marine Animals and Sea Turtles

Migratory or wide-ranging marine mammals and sea turtles that may be present in the GOA may be affected by natural events and anthropogenic activities that occur in areas far removed from Alaska waters, on breeding grounds, migration routes, wintering areas, or other habitats within a species' range. Events and activities that affect the habitats and populations of these marine species outside the GOA include the following:

- Disease
- Natural toxins
- Weather and climatic influences including climate change impacts
- Navigational errors
- Natural predation
- Fishing
- Hunting (including sea turtle egg predation)

- Ocean pollution
- Habitat modification or destruction
- Commercial shipping, fishing, and other vessel traffic
- Scientific whaling

These stressors on marine habitats in migratory wintering areas and on marine mammals and sea turtles when those animals are outside the GOA are discussed in detail in Section 3.8. In general, both natural and anthropogenic factors affect the health of marine mammal populations.

4.2 CUMULATIVE IMPACTS ANALYSIS

The cumulative impacts of training activities over land were previously analyzed in Section 1.6.2.1 and Appendix L of the *Alaska MOA EIS* (USAF 1995); Section 3.0 and Appendix C of the *Improvements to Military Training Routes in Alaska Environmental Assessment* (USAF 2007); Sections 3.18, 4.18, and 4.23 of the *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* (Army 1999); and Sections 3.12, 4.12, and 9.3 of the *Transformation of U.S. Army Alaska FEIS* (Army 2004). The nature and extent of training on Air Force and Army inland training lands has not changed substantially during the past five years, and is not expected to change substantially in the foreseeable future (with the exception of the USARAK Stationing and Training of Increased Aviation Assets included in Table 4-1). No activities conducted within the TMAA have been analyzed in the previous documents but are analyzed for cumulative impacts in individual sections below.

4.2.1 Air Quality

4.2.1.1 Air Pollution

The offshore area of the GOA has few sources of air pollutants and good atmospheric ventilation. The intensity of ocean uses, and correspondingly the density of air pollutant sources, generally declines with increasing distance from the coast. Air pollutant sources affecting air quality in the GOA are primarily mobile sources such as vessels and aircraft. Commercial ocean industries, such as fishing and ocean transport, are dispersed over broad areas. Typical air pollutants include engine exhaust gases and process emissions from fishing vessels or other ocean vessels. Local meteorological conditions and atmospheric transport processes disperse these emissions over a large area. Because most of the GOA (that portion more than 3 nautical miles [nm] from the coast) is beyond the jurisdiction of the State of Alaska, no emissions inventory for the GOA is available. The air quality of Pacific Ocean offshore waters generally is relatively high, however, indicating that current air pollutant emissions in the region are generally not causing substantial adverse effects.

Air pollutant concentrations in the GOA will likely increase in the future. Some of the projects listed in Table 4-1 (bridge and port projects) are expected to increase vessel traffic, with attendant increases in air pollutant emissions. The expected regional trends in fishing (Section 4.1.3.1), marine traffic (Section 4.1.3.2), and commercial aviation (Section 4.1.3.3) are also expected to increase air pollutant emissions. New coastal development (see Table 4-1), especially large point sources such as power plants or extractive industries could – depending upon their locations relative to the GOA – contribute to increased levels of air pollutants. The degree to which these activities will cumulatively increase regional air pollutant concentrations is not known; current aircraft and vessels are more fuel-efficient than in the past, and these design trends are expected to continue due both to the increased cost of fossil fuels and to the imperative to reduce emissions of GHG. Under any foreseeable scenario, however, increases in air pollutant emissions in the GOA region would not be sufficient to measurably degrade air quality within the GOA. Therefore, past, present, and reasonably foreseeable activities in the GOA, including the Proposed Action, would not have a cumulatively significant impact on regional air quality.

4.2.1.2 Greenhouse Gases

Greenhouse Gases

It has been generally accepted in the scientific community that anthropogenic emissions of GHG over the past century, in the aggregate, have led to increasing global air temperatures. GHG, including carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases, have a propensity to trap heat in the atmosphere. CO_2 is the predominant greenhouse gas emitted by human activities, primarily from the combustion of fossil fuels such as coal, oil, and natural gas. The observed increase in average global air temperatures since the mid-20th Century is very likely a result of increased atmospheric concentrations of GHG (Intergovernmental Panel for Climate Change [IPCC] 2007). This phenomenon is commonly referred to as "global warming." Global warming due to GHG emissions induces climate change through the complex interaction of increased temperature with various natural processes such as ocean and atmospheric circulation. Effects of climate change in turn create complex feedback loops, such as loss of reflective snow and ice cover, that increase the rate of climate change. Scientists are now in general agreement that climate change is occurring (American Meteorological Society 2007, Alaska State Legislature 2008), and that current trends are very likely to continue unless worldwide emissions and atmospheric concentrations of CO_2 and other GHG are substantially reduced (Ledley et al 1999, Energy Information Agency 2008).

Climate Change

As noted by the IPCC, climate change in the Arctic over the last half-century has been well documented. Alaska's climate has warmed by about 4°F (2.2°C) since the 1950s, and about 7°F (3.9°C) in interior Alaska during the winter. The State experienced a 30-percent average increase in precipitation between 1968 and 1990. The growing season has lengthened by about two weeks. Changes in the climate of Alaska have had several direct and indirect effects on animals, indigenous peoples, and coastal communities. Among the effects are rising air and ground temperatures, loss of sea ice, loss of protection from fall storms, and retreat of the permafrost boundaries. Sea ice has retreated by about 14 percent since 1978, and thinned by 60 percent since the 1960s, resulting in widespread effects on marine ecosystems, coastal climates, and human settlements. Permafrost has melted, causing erosion, landslides, and damaged infrastructure in central and southern Alaska. Recent warming has been accompanied by increases in forest disturbances, including insect infestations. A sustained infestation of spruce bark beetles, limited in the past by low temperatures, has caused widespread tree mortality over 2.3 million acres (906,000 hectares) on Kenai Peninsula since 1992, the largest loss of trees to insects ever recorded in North America (IPCC 2007).

Effects of climate change on Arctic marine mammals are poorly understood, due to lack of integrated baseline data (Burek et al. 2008). This lack of data on health, diseases, and toxic effects in Arctic marine mammals severely limits our ability to predict the effects of climate change on marine mammal health. The overall health of an individual animal is the result of complex interactions among immune status, body condition, pathogens and their pathogenicity, toxicant exposure, and the various environmental conditions that interact with these factors. Climate change could affect these interactions in several ways. There may be direct effects of loss of the sea ice habitat, elevations of water and air temperature, and increased occurrence of severe weather. Some of the indirect effects of climate change on animal health will likely include alterations in pathogen transmission due to a variety of factors, effects on body condition due to shifts in the prey base/food web, changes in toxicant exposures, and factors associated with increased human habitation in the Arctic (e.g., chemical and pathogen pollution in the runoff due to human and domestic-animal wastes and chemicals and increased ship traffic with the attendant increased risks of ship strike, oil spills, ballast pollution, and possibly acoustic injury). The extent to which climate change will impact marine mammal health will also vary among species, with some species more sensitive to these factors than others. Baseline data on marine mammal health parameters along with

matched data on the population and climate change trends are needed to document these changes (Burek et al. 2008).

Ocean Acidity

It has been posited that the continued emission of CO_2 is resulting in seawater becoming more acidic as CO_2 from the atmosphere dissolves in the oceans. Ocean acidification from the invasion of CO_2 is a recognized phenomenon (Cicerone et al. 2004, Feely et al. 2004, Sabine et al. 2004). Scientists estimate that the oceans are now about 25 percent more acidic than they were at the start of the industrial revolution about 300 years ago.

The negative effects of ocean acidification are likely to be felt on biological processes such as calcification (Orr et al. 2005, Kleypas et al. 2006). Ocean acidification from CO_2 invasion and reduced ventilation also may result in decreases in sound absorption for frequencies lower than 10 kHz (Hester et al. 2008). This would result in increases in ambient noise levels in ocean environments, and enhanced propagation of anthropogenic sound. The scale of potential acidification is presently unknown, due to lack of data and challenges associated with sampling on a basin-wide or regional scale. While this phenomenon is under study (cf. Hester et al. 2008), the effects of CO_2 emissions on ocean acidity and the resultant potential for enhanced sound propagation remain indeterminate due to incomplete information.

The cold water and broad, shallow continental shelves bordering the GOA could make this area more susceptible to acidification than warmer portions of the ocean. The colder the water, the higher its dissolved gases content; cold water absorbs more CO_2 than warm water. The vast shallow continental margins around the GOA also could maintain higher concentrations of CO_2 because there is less mixing of surface layers with deeper ocean waters (University of Alaska 2009). Atmospheric CO_2 concentrations are expected to increase, at least in the near-term, and increases in ocean acidity are expected to generally reflect those increases.

Cumulative Effects

The potential effects of proposed GHG emissions are by nature global and cumulative impacts, as individual sources of GHG emissions are not large enough to have an appreciable effect on climate change. Therefore, an appreciable impact on global climate change would only occur when proposed GHG emissions combine with GHG emissions from other man-made activities on a global scale.

Currently, there are no formally adopted or published NEPA thresholds of significance for GHG emissions. Formulating such thresholds is problematic, as it is difficult to determine what level of proposed emissions would substantially contribute to global climate change. Therefore, in the absence of an adopted or science-based NEPA significance threshold for GHGs, this EIS compares GHG emissions that would occur from the Preferred Alternative to the U.S. GHG baseline inventory of 2006 to determine the relative increase in proposed GHG emissions.

CO_2, N_2O, and CH_4 are generated during Navy training activities primarily through combustion of fossil fuels by vessels, aircraft, and energetic or powered training items (e.g., missiles, bombs). For purposes of determining the project contribution to global climate change, all GHG emitted during a training exercise are included. For ease of expression, the amounts of GHG other than CO_2 are added to the total amount of CO_2 to produce a single CO_2-equivalent ($CO_{2\text{-}e}$) value.

On a per-molecule basis, N_2O and CH_4 have more effect on global climate change than CO_2. Therefore, these values are weighted based on their Global Warming Potential (GWP) relative to CO_2. The GWP of N_2O is 310 and the GWP of CH_4 is 21. Thus, the calculation of $CO_{2\text{-}e}$ is:

$$CO_{2\text{-}e} = CO_2 + 310*N_2O + 21*CH_4$$

Navy training activities in the TMAA under the No Action Alternative will generate an estimated 22,000 TPY of $CO_{2\text{-}e}$. This amount is approximately 0.0003 percent of the nationwide GHG emissions in 2006 (USEPA 2008).

Navy training activities in the TMAA under Alternative 1 would generate an estimated 23,171 TPY of $CO_{2\text{-}e}$, an increase of about 1,200 TPY over that generated under the No Action Alternative. The amounts of GHG emitted under Alternative 1 are approximately 0.0003 percent of the nationwide GHG emissions in 2006 (USEPA 2008).

Navy training activities in the TMAA under Alternative 2 would generate an estimated 48,530 TPY of $CO_{2\text{-}e}$, an increase of 26,530 TPY over that generated under the No Action Alternative. This amount is approximately 0.0007 percent of the nationwide GHG emissions in 2006 (USEPA 2008).

Table 4-2 summarizes the annual GHG emissions associated with implementation of the Preferred Alternative. Under any of the alternatives, the contribution of the Proposed Action to national GHG emissions, and thus to climate change and ocean acidity, would be insignificant.

Table 4-2: Annual GHG Emissions

Scenario	Emissions, tons/year[1]			
	CO_2	N_2O	CH_4	$CO_{2\text{-}e}$
No-Action Alternative	21,708	0.7	3.6	22,003
Alternative 2 (Preferred Alternative)	47,881	1.6	7.9	48,530
Increase	26,173	0.9	4.3	26,527
U.S. 2006 Baseline Emissions (10^6 metric tons)[2]	-	-	-	7,054.2
Preferred Alternative Emissions as a % of U.S. Emissions	-	-	-	0.0007

Notes:
1 $CO_{2\text{-}e} = (CO_2 * 1) + (CH_4 * 21) + (N_2O * 310)$.
2 (USEPA 2008)

Navy Stewardship

In response to concerns over climate change, Department of the Navy leadership has initiated broad programs to reduce energy consumption and shift energy demand to renewable and alternative fuels to the extent consistent with its national security mission, thereby reducing emissions of CO_2 and other GHG. The Navy has implemented a number of shore installation and fleet programs that have substantially reduced the generation of GHG, primarily through conservation of fossil fuels and electricity.

Ashore, the Navy has aggressively encouraged its installations to reduce energy use, both through facility competitions and through investments in solar, wind, and geothermal technologies. Since 1985, the Navy has sponsored a world-wide energy management program that has reduced its energy use by more than 29 percent (Naval Facilities Engineering Command [NAVFAC] Public Affairs, 10/26/2005). At Pearl Harbor, for example, the installation of approximately 2,800 energy-efficient light fixtures has reduced electricity use by about 758 megawatt-hours (MWh) per year, equal to 448 tons per year (TPY) of CO_2 emissions (NAVFAC Public Affairs, 3/18/2008). New air conditioning chillers also installed at this installation will save another 252 MWh of electricity per year, equal to about 149 TPY of CO_2 emissions. Implementing similar energy conservation measures at Navy shore installations world-wide has substantially decreased the Navy's carbon footprint, and the Navy continues to identify new energy conservation measures.

Energy conservation aboard Navy vessels at sea also has achieved substantial reductions in fuel consumption, and thus emissions of GHG. Naval Sea Systems Command has established an Energy Conservation Awards Program to reward leading fuel conservers among underway surface ships with special recognition and cash incentives. During the first half of 2009, this program reduced the Navy's fuel consumption by about 682,000 barrels, or about 346,000 tons of CO_2 emissions (Navy News Service 5/14/2009).

The Navy also is researching and implementing new technologies that may result in substantial additional fuel savings. The new amphibious assault ship Makin Island, using a new hybrid power propulsion system, saved an estimated 900,000 gallons of fuel (equal to about 11,000 tons of CO_2) on its initial voyage from the Gulf of Mexico to San Diego. As new Navy ships are placed into service and older ships are retired, the overall fuel efficiency of the Navy's fleet will substantially increase.

The Navy also is investigating new hull-cleaning technologies that could substantially reduce drag from fouling of vessel hulls by marine organisms, potentially saving millions of gallons of fuel per year. Finally, the Navy has successfully tested the use of biofuels with camelina oil to power aircraft. The Green Hornet biofuel program is the first aviation test program to test and evaluate the performance of a 50/50 biofuel blend in supersonic (above mach 1) operations – a critical test point to successfully clear the F/A-18 E/F for biofuel operations through its entire flight envelope (NAVAIR 2010). Camelina jet biofuel produces 80 percent less carbon emissions than conventional jet fuels (Scientific American 2009).

These examples illustrate the Navy's leadership role in achieving large-scale energy reductions that will substantially contribute to a long-term national effort to mitigate global climate change.

4.2.2 Expended Materials

Cumulative impacts of expended materials on ocean resources would consist of the effects of the Proposed Action in combination with the other past, present, and future actions and activities listed in Sections 4.1.2 and 4.1.3 that would expend hazardous and nonhazardous materials in offshore areas of the GOA, or that would affect the regional hazardous waste management system.

4.2.2.1 Materials Expended in the GOA

The international waters offshore of the GOA are considered to be relatively pristine. Overall, the quality of offshore Pacific Ocean waters and bottom sediments offshore are relatively high, indicating that local releases of hazardous materials are generally not causing substantial adverse effects. There is no central point of contaminant discharge, but the intensity of ocean uses, and correspondingly the density of hazardous materials discharges, generally declines with increasing distance from the coast. Commercial ocean industries, such as fishing and ocean transport, are dispersed over broad areas of the Pacific Ocean. Ocean currents and sediment transport processes disperse the released materials over a large area.

Quantities of solid wastes and other manmade materials deposited in the GOA each year are expected to remain at about current levels. Fishing gear is likely the largest component of expended materials, and the intensity, duration, and geographic range of fishing activity in the GOA are unlikely to substantially increase, as discussed in Section 4.1.3. Commercial, scientific, and recreational vessel traffic are expected to increase substantially as a result of the projects described in Section 4.12 (e.g., port expansion, ferry service) and the regional processes and trends described in Section 4.13, but these ocean users typically do not discard large quantities of materials in the ocean. Coastal development (see Table 4-1) could increase deposition of manmade materials in coastal areas, but such materials are not likely to be transported into the GOA in substantial quantities. No hazardous materials or wastes are expected to be deposited in State or federal waters, in the absence of upset conditions such as a natural disaster, and deposition of hazardous materials or wastes in international waters of the GOA is expected to be

negligible. Most of the expended materials deposited in the GOA are denser than seawater and inert, and thus persist for long periods on the ocean bottom, but because of their inert character they have little effect on benthic organisms or resources. Entanglement from expended materials would not be likely and would not contribute to cumulative impact. Overall, the impacts on GOA ocean resources of manmade materials expended by past, present, and reasonably foreseeable actions, projects, and activities, including the Proposed Action, would not amount to a significant cumulative impact.

4.2.2.2 Hazardous Materials Management

The current and reasonably foreseeable projects and activities described in Sections 4.1.2 and 4.1.3 will result in increased numbers of aircraft and vessels in the GOA. The quantities of hazardous materials used and hazardous wastes generated by these activities, and subsequently sent to hazardous waste management facilities in the region, are anticipated to be relatively small. Construction of new infrastructure in coastal areas and expansion of port facilities (see Table 4-1) likely will generate substantial quantities of hazardous wastes requiring disposal. While the regional costs for hazardous waste transport, treatment, storage, and disposal could increase substantially in response to increased cumulative demand, the hazardous waste management industry generally has sufficient physical capacity to respond to this increased demand.

Navy vessels engaged in training activities under the Proposed Action would offload used hazardous materials to the Navy shore facilities at their home ports, where the used materials would become part of the overall hazardous waste stream managed by the appropriate Navy facility. Increased levels of training would result in increased throughput of hazardous wastes, but likely would not require additional storage, transport, or disposal facilities ashore for these materials. The Navy's hazardous waste management system and procedures are adequate to accommodate an increase in hazardous waste volumes. While the costs for hazardous waste transport, treatment, storage, and disposal could increase substantially in response to increased cumulative demand, the hazardous waste management industry generally has sufficient capacity to respond to this increased demand. Overall, the impacts on the GOA from release of hazardous wastes expended by past, present, and reasonably foreseeable actions, projects, and activities, including the Proposed Action, would not amount to a significant cumulative impact.

4.2.3 Water Resources

Cumulative impacts on water resources would consist of the effects of the Proposed Action in combination with other past, present, and reasonably foreseeable actions (as listed in Sections 4.1.2 and 4.1.3). Marine hydrology, marine water quality, deposition of sediment or debris, or public uses of State or federal waters could be affected by these actions and continuing activities, possibly to a significant degree.

Some of the major infrastructure projects planned for the region, such as the Knik Arm Crossing, Port MacKenzie development, Port of Anchorage expansion, and new ferry service (see Table 4-1) could affect ocean water quality near the coast. New coastal development could release urban pollutants, such as oils and grease, that would be flushed into coastal waters. As discussed in Section 4.1.3.3, however, such pollutants do not substantially affect the quality of ocean waters in the GOA because they are rapidly buried in coastal benthic sediments and upwelling of deep oceanic water diverts surface waters away from the GOA.

Anticipated future activities within the GOA, however, could affect water quality there. Expansion of oil and gas leases in the GOA could increase releases of petroleum products, heavy metals, and drilling muds. Increased commercial, scientific, and recreational vessel traffic, especially cruise ships, would increase releases of gray water and oil and grease. Compliance with federal and state regulations, where they apply, would limit the release of such pollutants to *de minimis* amounts. Concentrations of POPs originating from outside the GOA also would increase. These activities and processes are expected to

have cumulative but non-significant effects on ocean water quality. The degree of degradation in the foreseeable future is not anticipated to be substantial, except perhaps for ocean acidification (see Section 4.2.1.2), and GOA waters are expected to continue to be relatively pristine. The amounts of materials expended in the ocean by the Proposed Action would not alter these conditions, as described in Section 3.3.2. Therefore, impacts on ocean water resources from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.4 Acoustic Environment (Airborne)

Cumulative impacts on the acoustic environment would consist of the effects of the Proposed Action in combination with other past, present, and reasonably foreseeable actions (as listed in Sections 4.1.2 and 4.1.3). To the extent that the aggregate effects of these actions and activities increased long-term average or short-term peak sound levels in the GOA or otherwise resulted in long-term degradation of the acoustic environment of the GOA, those cumulative effects could be significant.

Environmental noise in the GOA primarily results from transportation and resource extraction activities. Aircraft noise that exceeds background sound levels typically occurs under airport approach / departure corridors and under air traffic patterns near an airfield. As aircraft gain altitude, their noise contribution at ground level decreases, eventually merging with the background noise level. Commercial airliners and private planes traversing the GOA at a cruise altitude generally are not audible at the surface. Therefore, these sources can be excluded from the cumulative acoustic environment analysis.

Commercial ship traffic and fishing activities contribute occasional, short-term noise in the GOA. The airborne sounds they generate include steady low- to moderate-level passby noise, which from the standpoint of a fixed observer is a short-term event, and occasional short-term intrusive noise events in different locations at different times. In a region as large as the GOA, vessels do not often pass near each other, so these noise events seldom overlap in time or location. Thus, these discrete noise events generally are not additive, and produce no cumulative effect.

The intensity and geographical extent of fishing activities are expected to remain about the same for the foreseeable future, as discussed in Section 4.1.3. The projects described in Section 4.1.2 (e.g., port development and expansion); however, are expected to increase vessel traffic in the GOA, and commercial vessel traffic is generally expected to increase over time (see Section 4.1.3.2). Numbers of low-flying commercial and private aircraft (e.g., small planes, fish spotters, whale watchers) are expected to increase, as described in Section 4.1.3.5. The Proposed Action also would increase the numbers of intrusive noise events in the GOA. This generally more-intense use of the GOA during the six-week window for the Proposed Action is expected to increase the number of intrusive noise events during each three-week event and the potential for two or more sound events to overlap. Because the GOA is a very large geographic area and vessels and aircraft are not often near each other, the potential for overlapping sound events would remain low. Peak and average noise levels at a specific location would remain largely unchanged. Therefore, impacts on marine noise environment from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.5 Marine Plants and Invertebrates

The GOA is among the world's most productive marine regions, supporting large and relatively healthy populations of phytoplankton, zooplankton, and commercially valuable pelagic and benthic invertebrates. At present, water quality is relatively high which supports the productivity of the GOA region.

Cumulative projects and processes affecting future marine conditions in the GOA (see Sections 4.1.2 and 4.1.3) include increased vessel traffic as a result of port development (see Table 4-1) and increased resident populations; increased runoff of sediments and urban pollutants from new coastal development (see Table 4-1); and continuing seabed damage, water pollution, deposition of debris, and underwater noise from fishing and other vessel operations. Future climate change is expected to increase average ocean water temperature, increase CO_2 concentrations, and increase acidity. Potential effects on marine plants and invertebrates in the GOA include long-term changes in species abundance or diversity, loss or degradation of sensitive habitats, and adverse effects to rare species. In addition, marine invertebrates may experience direct mortality or injury from commercial fishing operations or other resource extraction industries (e.g., oil and gas development). Plant and invertebrate populations may both experience long-term changes in abundance and diversity as a result of climate change and ocean acidification. Cumulative effects on marine plants and invertebrates are expected to be less than significant in the foreseeable future.

The Proposed Action was evaluated for long-term effects on marine communities that would result from explosions based on their force, location, and proximity to the bottom. Based on the short duration of annual training activities and the analysis presented in Section 3.5, the Proposed Action would not result in long-term changes in species abundance or diversity, loss or degradation of sensitive habitats, or effects on threatened and endangered species. The Proposed Action would not affect the sustainability of marine resources, the regional ecosystem, or the human community. Therefore, impacts on marine plants and invertebrates from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.6 Fish

The GOA is a highly productive region for various fish populations, largely as a result of a rich population of microscopic organisms that form the basis of the food chain. The GOA also is an important spawning area for many fish species, supporting a diverse array of fish larvae. The fish fauna in offshore portions of the GOA is dominated by large epipelagic species, and offshore areas provide the principal feeding habitat for many species.

Current and anticipated future projects and ongoing processes in the GOA region, particularly port development and new coastal development, as described in Table 4-1, and general population growth in Alaska, would increase vessel traffic through the GOA. Increased vessel traffic would, in turn, incrementally increase marine pollution, including the frequency and extent of underwater noise. Coastal development could increase the amount of sediments and urban pollutants released into coastal waters but, due to the circulation patterns of the GOA, such releases probably would not affect water quality in the GOA. Ongoing commercial fishing operations would affect commercially valuable fish species and ongoing recreational fishing could affect populations of game fish, although proper management of these industries would prevent any substantial declines in fish populations. Ocean bottom disturbance and damage from fish trawls would continue; recovery of these areas is very gradual, so degradation of the ocean floor and attendant loss of habitat for some fish species is cumulative within the foreseeable future. Climate change and ocean acidification (see Section 4.2.1.2) may alter prey abundance and distribution, or alter the distribution and abundance of competitors and predators. With the possible exception of climate change and ocean acidification, the long-term effects of which are not well understood, the cumulative impacts of past, present, and reasonably foreseeable projects and processes in the GOA would be less than significant.

Potential contributions of Navy training exercises to cumulative impacts on fish include releases of chemicals into the ocean, introduction of military expended materials into the water column and onto the seafloor, mortality and injury of marine organisms and fish near the detonation or impact point of ordnance or explosives, and physical and acoustic impacts of vessel activity (disturbance and collisions).

Based on the short duration of the Proposed Action and the analysis provided in Section 3.6 of the EIS/OEIS, impacts on fish from explosions may result in injury or mortality to individual fish but would not result in significant impacts to fish populations.

Disturbance of the water column would be short-term and local, while disturbance of benthic habitats would be unlikely due to the water depths where training activities occur. As described in Section 3.6, habitat disturbance, fish injury, and mortality from explosions are reduced by Navy mitigation measures. For this reason, there would be no adverse effects to Habitat Areas of Particular Concern (HAPC) by avoidance with these areas for SINKEX activities. Activities would not adversely affect fish populations or EFH as defined under the MSFCMA. However, activities may affect threatened and endangered species. The overall contribution of the Proposed Action to cumulative impacts on fish stocks in the GOA would not be a significant cumulative impact because no long-term changes in species abundance or diversity and no loss or degradation of sensitive or critical habitats are anticipated.

4.2.7 Sea Turtles

The only species of sea turtle expected to occur regularly in the GOA is the leatherback turtle, which is globally distributed, although likely low in number in the GOA. Adult leatherbacks can tolerate a wide range of water temperatures, and have been sighted along the west coast of the United States as far north as the GOA. Leatherback turtles appear to forage in the GOA in limited numbers, but no nesting grounds are located in the region. Leatherback turtles are endangered throughout their range (National Oceanic and Atmospheric Administration [NOAA] 2007).

Leatherback turtle populations can be affected both directly and indirectly by human activities. Incidental "take" in fishing operations, or bycatch, is one of the most serious direct threats to sea turtle populations. In the Pacific, NMFS requires measures (e.g., gear modifications, changes to fishing practices, and time/area closures) to reduce sea turtle bycatch in the Hawaii- and California-based pelagic longline fisheries and the California/Oregon drift gillnet fishery. In 2000, an estimated 50,000 leatherbacks were incidentally taken worldwide as pelagic longline bycatch (Lewison et al. 2004).

Sea turtles also can ingest marine debris or become entangled in debris (e.g., tar balls, plastic bags, plastic pellets, balloons, and ghost fishing gear). Marine pollution from coastal runoff, marina and dock construction, dredging, aquaculture, oil and gas exploration and extraction, increased underwater noise, and boat traffic can also degrade marine habitats used by sea turtles. In addition, sea turtles swimming or feeding at or just beneath the surface of the water are vulnerable to boat and vessel strikes, which can result in serious propeller injuries and death. Global warming could affect all aspects of a leatherback turtle's life cycle, as well as the abundance and distribution of its prey.

Current and anticipated future projects that increased the volume of vessel traffic (see Table 4-1) and ongoing processes that increased the volume of marine vessel traffic (see Sections 4.1.3.1, 4.1.3.2, and 4.1.3.4) would increase the potential for vessel strikes and increase the volume of marine debris. Bycatch from fishing operations would not change substantially because the intensity and extent of fishing operations in the GOA are not expected to change, as discussed in Section 4.1.3.1. Marine pollution, including the frequency and intensity of underwater noise, is expected to increase in response to increased vessel traffic and increased coastal development. The effects of the Exxon Valdez spill are still ongoing and are continually being restored through work with the Exxon Valdez Oil Spill Trustee Council (Table 4-1). Climate change (see Section 4.2.1.2) may alter prey abundance and distribution, or alter the distribution and abundance of competitors and predators. These anticipated future conditions are generally not expected to substantially affect the level of foraging by leatherback turtles in the GOA, although climate change may result in a northward expansion of sea turtle foraging activity. Therefore, impacts on sea turtles from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.8 Marine Mammals

During the past few decades, marine mammal mortalities have increased in association with a variety of human activities (Geraci et al. 1999, NMFS 2007a) (Figure 4-1). These activities include fisheries interactions (bycatch, directed catch), ship strikes (Laist et al., 2001) pollution (marine debris, toxic compounds), habitat modification (degradation, prey reduction), and gunshots. Other concerns include entanglement, underwater noise, and climate change, and associated changes in the physical characteristics and chemistry of marine waters, and other environmental factors. Potential cumulative impacts of past, present, and reasonably foreseeable future projects and activities (Sections 4.1.2 and 4.1.3) on marine mammals would result primarily from increased commercial and recreational vessel traffic (underwater noise, ship strikes, air and water pollutants), as discussed in Table 4.1 and Section 4.1.3.2, and ongoing commercial fishing (bycatch, entanglement, prey reduction, marine debris, and habitat degradation), as discussed in Section 4.1.3.1.

4.2.8.1 Fisheries Interaction: By-Catch, Directed Catch, and Entanglement

The incidental catch of marine mammals in commercial fisheries is a significant threat to the survival and recovery of many populations of marine mammals (Geraci et al. 1999, Baird et al. 2002, Culik 2002, Carretta et al. 2004, Geraci and Lounsbury 2005, NMFS 2007a). Interactions with fisheries and entanglement in discarded or lost gear continue to be a major factor in marine mammal deaths worldwide (Geraci et al. 1999, Nieri et al. 1999, Geraci and Lounsbury 2005, Read et al. 2006, Zeeberg et al. 2006). For instance, baleen whales and pinnipeds have been found entangled in nets, ropes, monofilament line, and other fishing gear that has been discarded out at sea (Geraci et al. 1999, Campagna et al. 2007).

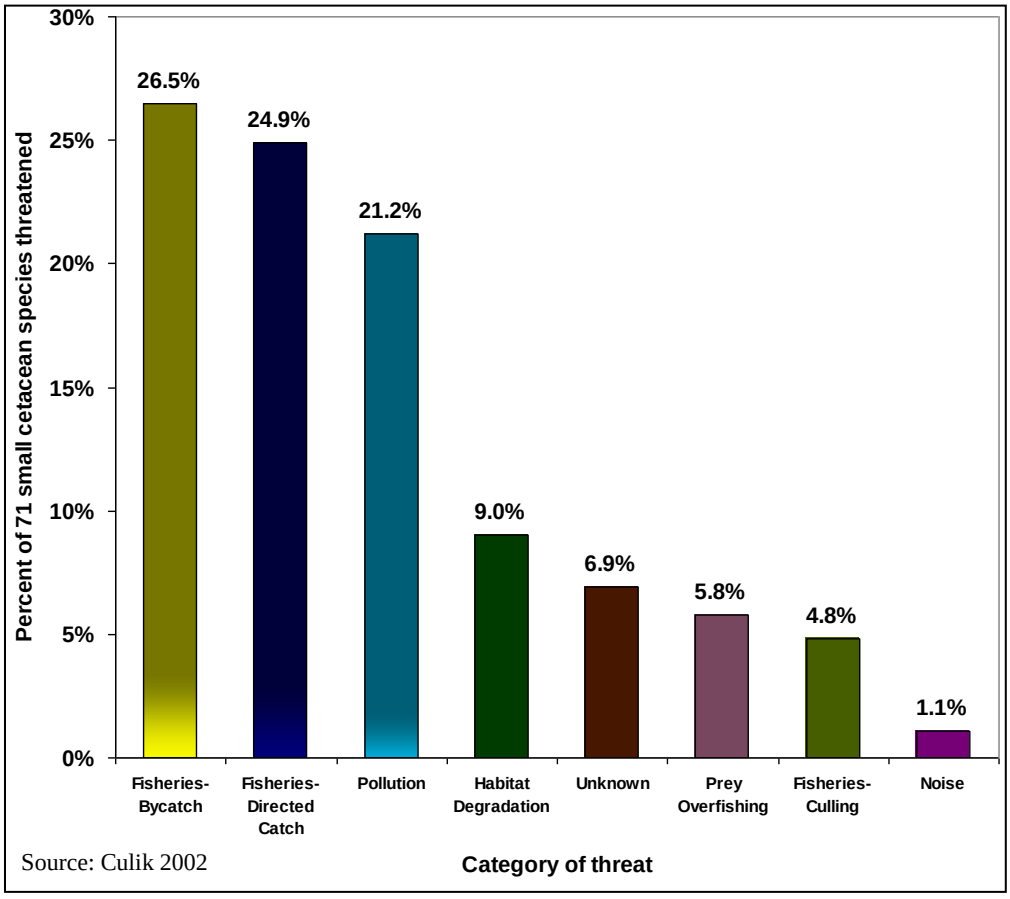


Figure 4-1: Human Threats to World-wide Small Cetacean Populations

Bycatch- Bycatch is the catching of non-target species within a given fishing operation and can include non-commercially used invertebrates, fish, sea turtles, birds, and marine mammals (NRC 2006). Read et al. (2006) attempted to estimate the magnitude of marine mammal bycatch in U.S. and global fisheries. Within U.S. fisheries, between 1990 and 1999, the mean annual bycatch of marine mammals was 6,215 animals. Eighty-four percent of cetacean bycatch occurred in gill-net fisheries, with dolphins and porpoises constituting most of the cetacean bycatch (Read et al. 2006). Over the last decade marine mammal bycatch declined by 40 percent, primarily in response to conservation measures that were implemented during this period. Based on the mature state (minimal growth) of the Alaskan fishing industry and the continuing implementation of conservation measures, the amount of marine mammal bycatch associated with commercial fishing in the GOA is expected to remain steady or decline slightly in the future. The Proposed Action would have no direct or indirect effects on the level of fisheries bycatch in the GOA.

Entanglement- Entanglement in active fishing gear is a major cause of death or severe injury among the whale species in the GOA. Entangled marine mammals may drown, escape with pieces of gear still attached to their bodies, or be set free either by their own efforts or by fishermen. Many large whales carry off fishing gear after becoming entangled (Read et al. 2006). When a marine mammal swims off with gear attached, the result can be fatal. The gear may be too cumbersome for the animal or it may be wrapped around a crucial body part and tighten over time. Stranded marine mammals frequently exhibit signs of previous fishery interaction, such as scarring or gear attached to their bodies. Deaths of stranded marine mammals often are attributed to such interactions (Baird and Gorgone 2005). Marine mammals that die from fisheries interactions may not wash ashore and not all animals that do wash ashore exhibit clear signs of interactions, so data probably underestimate fishery-related mortality and serious injury (NMFS 2005).

From 1998-2005, based on observer records, five fin whales (CA/OR/WA stock), 12 humpback whales (ENP stock), and six sperm whales (CA/OR/WA stock) were either seriously injured or killed in fisheries off the west coast of the United States (California Marine Mammal Stranding Network Database 2006). Reported entanglements thus average about three whales per year for the entire west coast. As discussed in Section 3.8.3.3, according to the July 2007 NMFS Pacific Islands Region Marine Mammal Response Network Activity Update, there were reports of 26 distressed marine mammals in Hawaii found entangled in fishing gear for the 6-month period from November to April 2007. Based on the type of fishing gear, some of these animals were entangled during the Alaska portion of their annual migration cycle. Additional information on fishery interactions in Alaska specific to each species is presented in Section 3.8 (for general information see http://www.fakr.noaa.gov/protectedresources/strandings.htm and Appendix F).

Fishing practices are unlikely to change substantially in the foreseeable future, so this source of whale injury and mortality is expected to remain about the same for the foreseeable future. The Proposed Action would have no direct or indirect effects on the level of marine mammal entanglements in the GOA.

As discussed in Section 3.8, parachutes associated with expendable materials, such as sonobuoys, are weighted and designed to sink after landing in the water; therefore, the period of time in which entanglement is possible is limited. They do not create the type of entanglement hazard resulting from the use of fishing gear involving a line connected to a recovery float at the surface. Entanglement from parachutes would not be likely and would not contribute to cumulative impacts.

4.2.8.2 Ship Strikes

Ship strikes of marine mammals are another cause of mortality and stranding (Laist et al. 2001, Geraci and Lounsbury 2005, de Stephanis and Urquiola 2006). An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could

be cut by a vessel's propeller. The severity of injuries typically depends on the size and speed of the vessel and the size of the animal (Knowlton and Kraus 2001, Laist et al. 2001, Vanderlaan and Taggart 2007).

While there are reports and statistics of whales struck by vessels in U.S. waters, the magnitude of the risks that commercial ship traffic poses to marine mammal populations is difficult to quantify or estimate. In addition, information on vessel strike interactions between ships and marine mammals outside of U.S. waters is limited (de Stephanis and Urquiola 2006). Laist et al. (2001) concluded that ship collisions may have a negligible effect on marine mammal populations, except for small regional populations or population segments where the relative significance of a few collisions would be greater.

Commercial ports and associated commercial vessel traffic have grown as a result of the globalization of trade. The Final Report of the NOAA International Symposium on "Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology" stated that the worldwide commercial fleet has grown from approximately 30,000 vessels in 1950 to over 85,000 vessels in 1998 (NRC 2003, Southall 2005). Current statistics support the prediction that the international shipping fleet will continue to grow at the current rate or at greater rates in the future. Shipping densities in specific areas and trends in routing and vessel design are as significant, or more significant, than the total number of vessels. Densities along existing domestic and international coastal routes are expected to increase. New routes are also expected to develop as new ports are opened and existing ports are expanded. New vessel propulsion systems are also advancing toward faster ships operating in higher sea states at lower costs; and container ships are expected to become larger along certain routes (Southall 2005).

Among the regional projects identified in Section 4.1.2 are developments at Port MacKenzie and at the Port of Anchorage, both of which are expected to increase the amount of commercial vessel traffic in the GOA. Ferry service and cruise ship traffic also are expected to increase, and new oil and gas developments also may encourage additional vessel traffic in the GOA. The numbers and sizes of fishing vessels operating in the GOA are expected to remain about the same as at present. The cumulative effect of these projects and trends is expected to be a moderate increase in large commercial vessel traffic in the GOA in the foreseeable future.

As discussed in Section 3.8, regulations governing the approach to humpback whales in Alaska were promulgated in 2001 to manage the threat caused by whale watching activities (NOAA 2001). Available data on ship strikes in Alaska waters presented in an unpublished preliminary summary indicates 60 recorded collisions between vessels and humpback whales (two additional involved a sperm and a gray whale; Gabriele et al., manuscript on file). None of these recorded collisions involved Navy vessels. Nine ship strikes were implicated in mortality or serious injuries of humpback whales between 2001 and 2005; seven of these ship strikes occurred in Southeast Alaska and two occurred in the northern portion of the Central North Pacific's range (Angliss and Allen 2008). Additional information on ship strikes in Alaska specific to each species is presented in Section 3.8. For general information involving ship strikes in Alaska, see http://www.fakr.noaa.gov/protectedresources/strandings.htm and Appendix F.

Ship strikes on marine mammals in the future are expected to increase in rough proportion to the increased volume of ship traffic and an increase in the average speed of these vessels. Based on the most recent scientific information, however, the cumulative impact of ship strikes on marine mammal populations in the GOA is unlikely to be significant (Laist et al. 2001).

U.S. Navy vessel traffic is a small fraction of the commercial and recreational vessel traffic in the GOA. While U.S. Navy vessel movements may incrementally contribute to the ship strike threat, given the lookout and mitigation measures adopted by the U.S. Navy, the probability of vessel strikes is greatly reduced. Furthermore, actions to avoid close interaction of U.S. Navy ships and marine mammals, such as maneuvering to avoid any observed marine mammal are part of existing at-sea protocols and standard

operating procedures. Navy ships have up to three or more dedicated and trained lookouts as well as two to three bridge watchstanders during at-sea movements who would be searching for any whales or other obstacles on the water surface. Such lookouts are expected to further reduce the chances of a collision. Accordingly, impacts on marine mammals by ship strikes from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

Ingestion of Plastic Objects and Other Marine Debris and Toxic Pollution Exposure

Ingestion. For many marine mammals, debris is a great hazard. Not only is debris a hazard because of possible entanglement, but animals may mistake plastics and other debris for food (NMFS 2007b). Sperm whales have been known to ingest plastic debris, such as plastic bags (Evans et al. 2003, Whitehead 2003). While ingestion has led to mortality, the scale on which ingestion affects sperm whale populations is unknown, but Whitehead (2003) suspects it is not substantial at this time. The cumulative effect of the projects identified in Section 4.1.2 and the trends and processes described in Section 4.1.3 probably would be a minor increase in the levels of marine debris present in the GOA, and thus a minor increase in the instances of ingestion of marine debris by marine mammals. Given that this source of marine mammal mortality is not now substantial, and assuming a minor increase, then ingestion of marine debris is not expected to be a substantial source of marine mammal mortality in the future. Furthermore, the limited annual duration of Navy training activities in the GOA under the Proposed Action and Navy afloat procedures would assure that the Navy's contribution to cumulative marine debris pollution would be negligible (see Section 3.3.1.2 and Table 3.3-1 in Water Resources).

Toxic Pollution. High concentrations of potentially toxic substances within marine mammals, along with an increase in new diseases, have been documented in recent years. Scientists are considering possible links between pollutants and marine mammal mortality. The manmade chemicals called polychlorinated biphenyls (PCBs) and the pesticide dichlorodiphyenyltrichloroethane (DDT), for example, are both considered persistent organic pollutants; they are banned in the United States because of their harmful effects in wildlife and humans (NMFS 2007c). Despite having been banned for decades, the levels of these compounds in marine mammal tissue samples taken along U.S. coasts are still high (Hickie et al. 2007, Krahn et al. 2007, NMFS 2007c). Both compounds are long-lasting, reside in marine mammal fat tissues (especially in the blubber), are carcinogenic, and can have toxic effects such as reproductive impairment and immunosuppression (NMFS 2007c).

The effects of toxic pollutants on marine mammals are difficult to measure. However, some researchers have correlated contaminant exposure with possible adverse health effects in marine mammals (Borell 1993, O'Shea and Brownell 1994, O'Hara and Rice 1996, O'Hara et al. 1999). In addition to direct effects, marine mammals are indirectly affected by habitat contamination that degrades prey species availability or that increases disease susceptibility (Geraci et al. 1999). Vessel traffic and commercial fishing both contribute incrementally to marine pollution in the GOA through deliberate discharges of allowable wastes and byproducts, incidental and accidental discharges of petroleum products, and equipment and materials losses. Based on the projects and processes identified in Sections 4.1.2 and 4.1.3, a moderate increase is anticipated in the levels of toxic pollutants in the GOA in the foreseeable future. Thus, the cumulative impact would be less than significant.

U.S. Navy vessel operations in the GOA could release small amounts of pollutants into the water column. U.S. Navy vessels are not a typical source, however, of contaminants with bioaccumulation potential such as pesticides and PCBs. Before engaging in a SINKEX activity, the Navy must conduct an inventory of each SINKEX vessel to ascertain the presence of PCBs. This inventory and list of items removed prior to sinking must be provided to USEPA in the annual report that is required by the MPRSA permit. Furthermore, any vessel discharges associated with the vessels, such as bilge water and deck runoff, would be in accordance with international and U.S. requirements for eliminating or minimizing

discharges of oil, garbage, and other substances. Therefore, impacts on marine mammals by ingestion of plastic, military expended materials, marine debris, or toxic exposure from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.8.3 Anthropogenic Sound

Many marine mammals use sound to communicate, navigate, locate prey, and sense their environment. Underwater anthropogenic sound may interfere with these functions, although comprehension of the type and magnitude of any behavioral or physiological responses resulting from man-made sound, and how these responses may contribute to strandings, is rudimentary at best (NMFS 2007d). Marine mammals may respond both behaviorally and physiologically to anthropogenic sound exposure (e.g., Richardson et al. 1995, Finneran et al. 2000, Finneran et al. 2003, Finneran et al. 2005). However, the range and magnitude of the behavioral responses of marine mammals to various sound sources is highly variable (Richardson et al.,1995), and appears to depend on the species involved, the experience of the animal with the sound source, the motivation of the animal (e.g., feeding, mating), and the context of the exposure.

Marine mammals are regularly exposed to several sources of natural and anthropogenic sounds. Anthropogenic noise sources that could affect ambient noise levels arise from several types of activities in or near the ocean, any combination of which can contribute to the total noise level at any one place and time. These noise sources include: transportation; dredging; construction; oil, gas, and mineral exploration; geophysical (seismic) surveys; sonar; explosions; and ocean research (Richardson et al. 1995). Commercial fishing vessels, cruise ships, transport and recreational boats, and aircraft all generate underwater sound in the ocean (NRC 2003; NRC 2006). Several investigators have argued that anthropogenic sources of noise have increased ambient noise levels in the ocean over the last 50 years (NRC 1994, 2003, 2005; Richardson et al. 1995; Jasny et al. 2005; McDonald et al. 2006). Much of this increase is due to increased shipping because ships are becoming more numerous and of larger tonnage (NRC 2003, McDonald et al. 2006). Andrew et al. (2002) compared ocean ambient sound levels from the 1960s with those from the 1990s for a receiver off the California coast. The data showed an increase in ambient noise of approximately 10 decibel (dB) in the frequency range of 20 to 80 Hertz (Hz) and 200 and 300 Hz, and about 3 dB at 100 Hz over a 33-year period.

Sound emitted by large vessels, particularly during transit, is the principal source of noise in the ocean today, primarily due to the properties of sound emitted by civilian cargo vessels (Richardson et al. 1995, Arveson and Vendittis 2000). Ship propulsion and electric generation engines, engine gearing, compressors, bilge and ballast pumps, as well as hydrodynamic flow around a ship's hull and any hull protrusions, contribute to a large vessels' underwater noise emissions. Propeller-driven vessels also generate noise through cavitation, which accounts for much of the noise emitted by a large vessel and which is related to its speed. Military vessels underway or involved in naval activities or exercises also generate anthropogenic noise in the marine environment. Noise emitted by large vessels is low-frequency, continuous, and tonal. The sound pressure levels around the vessel vary according to its speed, burden, capacity, and length (Richardson et al. 1995, Arveson and Vendittis,2000). Vessels ranging from 135 to 337 meters generate peak sound levels of 169 - 200 dB between 8 Hz and 430 Hz, although Arveson and Vendittis (2000) documented components of higher frequencies (10-30 kHz) as a function of newer merchant ship engines and higher speeds. Given the propagation of low-frequency sounds, a large vessel in this sound range can be heard 139-463 kilometers away (Ross 1976 in Polefka 2004). U.S. Navy vessels, however, have incorporated significant underwater ship-quieting technology to reduce their acoustic signature, compared to a vessel of similar size, thus reducing their vulnerability to detection by enemy passive acoustics (Southall 2005).

As noted in Section 4.1.3.2, commercial and recreational vessel traffic in the GOA are expected to increase moderately in the foreseeable future, and underwater noise levels associated with vessel transits are expected to increase in rough proportion to this increase. Fishing vessel traffic in the GOA is expected to remain about the same as at present, although the average size and speed of fishing vessels may change over time. Oil and gas development, especially exploration, could be a substantial new source of underwater noise in the GOA, but this activity is expected to occur primarily along the northern and western margins of the GOA on the continental shelf. Overall, the level and geographic range of underwater noise in the GOA are expected to increase in the future in response to past, present, and reasonably foreseeable projects and processes, including the Proposed Action, but this cumulative increase would be less than significant.

Navy vessels would be present in the GOA for a small portion of the year under the Proposed Action, and thus their contribution to cumulative ship noise would be insignificant. As noted above, U.S. Navy vessels have underwater ship-quieting technology that reduces their acoustic signature compared to vessels of similar size, further reducing their contribution to cumulative underwater noise impacts. Naval sonars would operate in a limited number of areas, as discussed in Section 3.8, and most likely would not contribute substantially to underwater noise levels in the GOA. Modeling of atmospheric and underwater ordnance detonations for the Proposed Action (Section 3.8) indicated that few marine mammals, if any, would be exposed to underwater noise from these sources. In summary, impacts of underwater sound from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.8.4 Climate Change

The effect of large-scale climatic changes on the world's oceans, and how these changes impact marine mammals and influence strandings, are difficult to quantify, given the broad spatial and temporal scales involved and the cryptic movement patterns of marine mammals (Moore 2005; Learmonth et al. 2006). The most immediate, although indirect, effect would be decreased prey availability during unusual conditions. This, in turn, would result in increased search effort required by marine mammals (Crocker et al. 2006), potential starvation, and corresponding stranding due directly to starvation, disease, or predation while in a weakened or stressed state (Selzer and Payne 1988, Geraci et al. 1999, Moore 2005, Learmonth et al. 2006, Weise et al. 2006). Future changes in climate and ocean acidification resulting from human development and natural processes are likely to be cumulatively significant, based on current projections by the U.S. government. As discussed in Section 3.1, however, the contribution of the Proposed Action to this cumulative impact would be negligible.

4.2.8.5 Summary

Cumulative impacts on marine mammals from past, present, and reasonably foreseeable projects, processes, and trends would result primarily from climate change and fisheries interactions, with ship strikes, ingestion of and entanglement by marine debris, military expended materials, effects of toxic pollutants, and underwater noise all minor sources of impacts. The Proposed Action would not contribute to fisheries interactions, and its contributions to future ship strikes, ingestion of marine debris, military expended materials, health effects of marine pollutants, and climate change would be negligible. The Proposed Action would contribute minimally to cumulative increases in underwater sound in the GOA. Overall, impacts on marine mammals from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.9 Seabirds

Seabird populations within the GOA are affected by direct and indirect perturbations of breeding and foraging habitat on the coastal mainland and inshore islands. The single greatest concern is the loss of

suitable habitat for nesting and roosting seabirds throughout the coastal northwest due to land development and human encroachment. Historically, seabird populations have sustained numerous impacts from pollution and human activities within the GOA from a variety of sources, including the discharge of hazardous chemicals and sewage. Seabird populations in the GOA have become more susceptible to impacts due to their increased concentration. Large-scale effects on seabird populations such as global warming, reduced fish populations, and development in other regions or countries are not well defined for individual species but have been cited as contributing to the overall decline of seabirds.

Past, present and reasonably foreseeable future actions discussed in Section 4.1.2 (vessel traffic from port development, coastal development) and other activities described in Section 4.1.3 (increased commercial and recreational vessel traffic), together with the Proposed Action, would elevate the potential for direct and indirect impacts on seabirds, including the short-tailed albatross (a species listed under the federal Endangered Species Act). Increased vessel and low-flying aircraft traffic would result in a greater level of day-to-day disturbance of seabirds and interference with foraging activities. Increased ocean pollution could degrade the health of seabirds through direct exposure and through ingestion of trash or contaminated prey. New coastal development (see Table 4-1) would decrease lands available for seabird nesting and roosting. The cumulative effects of increased disturbance, decreased health, and decreased terrestrial habitat on seabird populations would be adverse, but less than significant. Therefore, impacts on seabird habitat from implementation of the Proposed Action (the Proposed Action would not directly affect land areas), in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.10 Cultural Resources

Consultation with the Alaska SHPO was conducted during the preparation of the *Alaska MOA EIS* and the *Transformation of U.S. Army Alaska FEIS*. Based on the previous consultations, no further analysis of prehistoric and historic archaeological resources on land is required.

Underwater archaeological resources are submerged sites that may have a cultural affiliation. This type of site includes shallow water or nearshore prehistoric or historic sites or isolated artifacts, historic shipwrecks, airplanes, or pieces of ship components, such as cannons or guns. Ship and aircraft wrecks are the only potential cultural resource of concern in the open ocean portions of the GOA. There are no known prehistoric or historic archaeological resources, architectural resources, or traditional cultural properties within the GOA.

Cumulative impacts on cultural resources would consist of the effects of the Proposed Action in combination with other cumulative actions and processes (as listed in Sections 4.1.2 and 4.1.3), that would affect shipwrecks and associated open ocean-bottom resources. Of the cumulative projects and activities identified in the GOA, only fish trawling could have such an effect. Trawling for bottom fish and invertebrates in the GOA is a widespread and long-standing practice. Bottom trawling and anchoring can damage benthic habitat and therefore disturb shipwrecks on the ocean floor (USDC, NOAA 2005; NOAA, NMFS 2006). Bottom trawling is conducted in many unprotected areas within the GOA and will continue for the foreseeable future.

The analysis presented determined that the Proposed Action would have no potential to affect underwater cultural resources on the floor of the ocean. In accordance with Section 106 of the NHPA, the Navy entered into consultation with the Alaska SHPO. On May 18, 2010, the Alaska SHPO signed a letter indicating concurrence with the Navy's analysis that the Proposed Action would not affect submerged cultural resources (see correspondence in Appendix C). Therefore, impacts on cultural resources from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.11 Transportation and Circulation

Cumulative impacts on airspace and marine traffic would consist of the effects of the Proposed Action in combination with other past, present, and reasonably foreseeable actions and processes (Sections 4.1.2 and 4.1.3) that would increase air and marine traffic volumes or conflicts within the GOA region. As discussed in Section 4.1.3.2, marine vessel traffic is expected to increase. As discussed in Section 4.1.3.5, commercial air traffic is expected to increase. Specific projects that would contribute to these general processes include port development, new ferry service, helicopter transits, and new bridge crossings (see Table 4-1).

At present, commercial air traffic through the TMAA is minimal, and this situation is not expected to change substantially in the future as a result of other projects and processes (e.g., growth in commercial airliner traffic, fish spotting aircraft, and oil and gas development. Airspace within the TMAA is only restricted by the Navy during hazardous training activities (a maximum of 42 days per year); these activities are coordinated with the FAA, and Notices to Airmen (NOTAMs) are issued. Aircraft in the vicinity are required to detour around the training area, and adjacent air corridors may experience more intense use. When hazardous activities occur on the inland ranges, military flight plans are coordinated with Anchorage and Fairbanks Air Route Traffic Control Center (ARTCC). Coordination with the FAA on matters affecting airspace and adherence to established operating rules within and around Special Use Airspace reduces or eliminates the possibility of indirect adverse impacts and associated cumulative impacts on civil aviation and airspace use. Thus, cumulative impacts on air transportation are expected to be less than significant.

Vessel traffic through the TMAA (other than fishing boats, which are addressed in Sections 3.6 and 3.11 Fish and Transportation and Circulation respectively) consists primarily of cargo vessels and tankers; whale-watching boats, cruise ships, and other vessel traffic in the GOA mostly use coastal areas outside of the TMAA. For hazardous training activities in the TMAA or W-612, the Navy issues a NOTMAR to notify non-participants to avoid the affected area. Regarding the PUTR, the installation is temporary (to be recovered once training is complete); therefore, no formal restricted areas would be designated and no limitations would be placed on commercial or civilian use of the area, thus limiting impacts to marine traffic. Although the resultant detours for cargo or tanker vessels traversing the TMAA may be inconvenient, they do not preclude the affected vessels from reaching their destinations.

Other current, planned, and reasonably foreseeable projects and processes in the GOA are not expected to have a substantial effect on vessel traffic and circulation. The volume of cargo vessels traversing the GOA is expected to increase moderately, while the volume of tanker traffic is not expected to change substantially. For hazardous training activities in the TMAA or W-612, the Navy would continue to issue NOTMARs. With cumulative increases in vessel traffic, the numbers of vessels detouring around the TMAA would increase, but the affected vessels would not be prevented from reaching their destinations. Thus, impacts on marine transportation from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.12 Socioeconomics

The economy of the coastal communities is based on commercial fishing of pink and red salmon, fish processing, timber, minerals, agriculture and tourism. Current socioeconomic conditions in the GOA primarily are associated with fishing. Several native communities in Alaska rely on the harvesting of marine resources (fish, shellfish, marine mammals, birds) for subsistence. Tourism also is a socioeconomic factor in the area, but tourism activities mostly occur in coastal waters. Vessels and aircraft transiting across the GOA value it as a relatively short, unimpeded route between source and destination; disruption or displacement of this traffic would incrementally increase operating costs for the

transportation industry. The area has some potential for oil and gas development, primarily on the continental shelves on its northern and western margins. Fishing in the GOA is a mature industry with little remaining potential for substantial growth, and the possibility exists that one or more major fisheries will be further restricted in the future to protect fish stocks from overfishing.

Several native communities in Alaska rely for their subsistence on the harvesting of marine resources (fish, shellfish, marine mammals, birds). The economy of the coastal communities is based on commercial fishing of pink and red salmon, fish processing, timber, minerals, agriculture and tourism. Shellfish fisheries developed in the 1960s in the Gulf of Alaska (see Our Living Oceans [NMFS 1999]).

Cumulative impacts on socioeconomics would consist of the effects of the Proposed Action in combination with other past, present, and reasonably foreseeable future actions and processes that would significantly affect regional employment, income, housing, or infrastructure. Port development and coastal development (see Table 4-1) would contribute to long-term economic growth. Increased marine vessel traffic (Section 4.1.3.2) and commercial air traffic (Section 4.1.3.5) would incrementally increase regional employment. Employment and income could be substantially affected by changes in fishing or tourism activities, or development of other resource extraction industries (e.g., oil and gas). Based on the socioeconomic resources available and sectors represented in the GOA, no direct cumulative impacts on housing or infrastructure are expected, although declines in employment and income could indirectly affect housing demand or funding for infrastructure projects.

Implementation of the Proposed Action alone would not produce any significant regional employment, income, housing, or infrastructure impacts. Effects on commercial and recreational fishermen, and boaters would be short-term and would produce some temporary access limitations. Some activities in the TMAA, especially if coincident with peak fishing locations and periods, could cause temporary displacement of and potential economic loss to individual fishermen. However, most activities within the TMAA are short in duration and have a small operational footprint. Effects on fishermen are mitigated by a series of Navy initiatives, including public notification of scheduled activities, near-real time schedule updates, prompt notification of schedule changes, and adjustment of hazardous activities areas. In selected instances where safety requires exclusive use of a specific area, fishermen may be asked to relocate to a safer nearby area for the duration of the activity. These measures would not have a noticeable effect on any individual fisherman, overall commercial revenue, or public recreational opportunities.

Implementation of the PUTR under the Proposed Action would require the Navy to issue a NOTMAR to limit the possibility of any interactions with fishing activities that could damage or disturb the sensors. If, as a part of complying with the NOTMAR, fishing activities are voluntarily shifted to a different area, this could place an economic hardship on commercial fishing enterprises if the range is deployed in a viable fishing area. However, the Navy will, to the maximum extent practicable, avoid commercially viable fishing areas when placing the PUTR.

Other current, planned, and reasonably foreseeable projects and processes would have little effect on socioeconomic conditions in the GOA. The fishing industry is not expected to change substantially (see Section 4.1.3.1). An expected moderate increase in cargo vessels (see Table 4-1 and Section 4.1.3.2) would have a small, but positive effect on socioeconomic conditions in the region, as would development of oil and gas resources on the outer continental shelf. Moderate growth in the tourism industry, especially in cruise ship traffic, as well as the local economic stimulus of planned infrastructure projects in coastal areas (see Table 4-1) would have a moderate, beneficial economic effect in communities on the northern and western margins of the GOA.

The aggregate effects of cumulative projects and processes on socioeconomic factors in the GOA region are expected to be moderately beneficial, but not significant. The Proposed Action, as noted above, would

not contribute to these cumulative impacts. Therefore, impacts on socioeconomics from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.13 Environmental Justice and Protection of Children

No permanent human population exists in the GOA, and no cumulative effects on environmental justice or protection of children are possible without resident populations. Populations within the greater GOA region are not affected by Navy training activities because of the rare and inconsistent nature of these activities. Based on these factors, no disproportionately high and adverse human health or environmental effects on minority or low-income populations would occur from implementation of the Proposed Action. Therefore, impacts on environmental justice and children from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

4.2.14 Public Safety

Despite the size of the GOA, the frequently severe weather, and the large number of vessels and aircraft that operate in or traverse the area, substantial accidents posing a safety risk to the public are rare. Most reported accidents involve commercial vessels. Of these, on-board fires appear to be the most common type of accident, followed by groundings. Vessel sinkings and collisions and aircraft accidents are very rare. The potentials for vessel groundings and collisions, moreover, are much higher in coastal waters where vessel traffic is substantially more congested than in the open GOA and obstacles to navigation are much more common. Thus, current risks to public safety in the GOA from past and present activities are very low.

Cumulative impacts on public safety would consist of the combined effects of the Proposed Action and other past, present, and reasonably foreseeable future actions and processes (as listed in Sections 4.1.2 and 4.1.3) on public safety conditions in the GOA. Navy training poses potential risks to the public in the GOA primarily through aircraft and vessel movements, live ordnance fire, and explosive ordnance, in combination with the accidental presence of non-participants in a designated temporary training area. Aircraft and ship collisions would be the primary public safety concern. These risks are minimized through standard Navy practices and procedures. The incremental increase in public safety risk from temporary Navy operations in the GOA probably is offset by the availability of substantial Navy physical assets and communications systems to assist in search-and-rescue operations in the event of an accident involving a commercial or private aircraft or vessel.

Other projects and activities that would increase the number aircraft or vessels in the GOA, or the duration of their presence there, such as additional cruise ship and marine cargo traffic (see Section 4.1.3.2) and increased commercial airliner traffic (see Section 4.1.3.5), could increase public safety risks in the future. Projects that increased the number of individuals present in the GOA also could increase the public safety risk by increasing the population exposed to such risks. Other proposed or operational commercial, industrial, and recreational activities in the GOA would not substantially affect public safety. Based on the existing low incidence of vessel and aircraft accidents and an anticipated moderate increase in aircraft and vessel activities in the GOA in the foreseeable future, the overall public safety risk in the GOA is expected to remain less than significant.

The Proposed Action would not contribute substantially to the public safety risks in the GOA resulting from other past, present, and reasonably foreseeable future actions. As noted above, the Proposed Action could have a beneficial effect on cumulative public safety risk in this remote region of the GOA because Navy assets could assist commercial or private aircraft or vessels in distress. Therefore, impacts on public safety from implementation of the Proposed Action, in combination with past, present, or planned projects and other activities within the GOA, would not be cumulatively significant.

5 Mitigation

5 MITIGATION MEASURES

As part of the Navy's commitment to sustainable use of resources and environmental stewardship, the Navy incorporates measures that are protective of the environment into all of its activities. These include employment of best management practice, standard operating procedures (SOPs), adoption of conservation recommendations, and other measures that mitigate the impacts of Navy activities on the environment. Some of these measures are generally applicable and others are designed to apply to certain geographic areas during certain times of year, for specific types of military training. Mitigation measures covering habitats and species occurring in the Temporary Maritime Activities Area (TMAA) have been developed through various environmental analyses conducted by the Navy for land and sea ranges and adjacent coastal waters.

The Navy has implemented a variety of marine mammal mitigation measures over the last two decades. The following discussion briefly describes the genesis and status of those mitigation measures.

Since the 1990s, the Navy has developed and implemented mitigation measures either as a result of environmental analysis or in consultation with regulatory agencies for research, development, test, and evaluation activities (RDT&E) and training exercises. These measures included visual detection by trained lookouts, power down and shut down procedures, the use of passive sensors to detect marine mammals, and avoidance of marine mammals.

In December 2000, the Navy issued a memorandum entitled "Compliance with Environmental Requirements in the Conduct of Naval Exercises or Training at Sea" (DoN, 2000). This memorandum clarified Navy policy for continued compliance with certain environmental requirements including preparation of environmental planning documents, consultations pursuant to the Endangered Species Act (ESA), and applications for "take" authorizations under the Marine Mammal Protection Act (MMPA).

In 2003, the Navy issued the Protective Measures Assessment Protocol (PMAP) that implemented Navy wide mitigation measures for various types of routine training events. Following the implementation of PMAP, the Navy agreed to additional mitigation measures as part of MMPA authorization and Endangered Species Act (ESA) consultation processes for specific training exercises from 2004-2007.

In order to make the findings necessary to issue the MMPA authorization, it may be necessary for the National Marine Fisheries Service (NMFS) to require additional mitigation or monitoring measures beyond those addressed in this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OE(S) (hereafter referred to as "EIS/OEIS"). These could include measures considered, but eliminated in this EIS/OEIS, or as yet undeveloped measures. In addition to commenting on this EIS/OEIS, the public has had an opportunity to provide information to NMFS through the MMPA process, both during the comment period following NMFS' Notice of Receipt of the application for a Letter of Authorization (LOA), and during the comment period following publication of the proposed rule. NMFS may propose additional mitigation or monitoring measures in the proposed rule. The suite of measures developed to date as a result of those MMPA processes are included and analyzed as part of this section.

Based on NMFS' preliminary determinations reached in the development of the proposed rule associated with the Gulf of Alaska, the Navy anticipates that NMFS will determine that the Final EIS/OEIS adequately analyzes the training activities in the Gulf of Alaska. NMFS is anticipated to adopt the GOA Final EIS/OEIS to support the proposed issuance of the MMPA incidental take regulations, the 2011 LOA, and future LOAs as appropriate. As mentioned above, NMFS must also prescribe regulations that set forth the means of affecting the least practicable adverse impact on affected species or stocks and their habitat (i.e., mitigation measures). This Final EIS/OEIS includes a suite of proposed mitigation measures,

a discussion of mitigation measures that were considered by the Navy and NMFS, but eliminated, and an indication that additional mitigation measures (either not discussed in the Final EIS/OEIS or measures considered but eliminated in the Final EIS/OEIS) may be required by NMFS/Navy Final Rule adaptive management process. As indicated in this Final EIS/OEIS, all alternatives include implementation of mitigation measures, and the analysis of mitigation alternatives will be specifically presented in this chapter of the Final EIS/OEIS.

Additionally, the Navy is engaging in consultation processes under the ESA with regard to listed species that may be affected by the activities described in this EIS/OEIS. For the purposes of the ESA section 7 consultation, the mitigation measures proposed here may be considered by NMFS as beneficial actions taken by the Federal agency or applicant (50 CFR 402.14[g][8]). If required to satisfy requirements of the ESA, NMFS may develop an additional set of measures contained in Reasonable and Prudent Alternatives, Reasonable and Prudent Measures, or Conservation Recommendations in any Biological Opinion issued for this Proposed Action.

The Navy has also considered public comments on proposed mitigation measures described in this EIS/OEIS as indicated in Appendix I.

This chapter describes mitigation measures applicable to military service activities in the TMAA. As previously mentioned, the majority of training activities conducted by the Navy are contained within the TMAA. For Navy training activities that do occur in the inland ranges of the United States (U.S.) Air Force (USAF) and the training lands of the U.S. Army, applicable rules, regulations, safety procedures, standard operating procedures, and mitigation measures of those installations and training areas will be observed by all Navy participants. As such, this chapter focuses on protective measures specific to activities conducted within the TMAA and Warning Area 612 (W-612).

5.1 CURRENT REQUIREMENTS AND PRACTICES

5.1.1 Air Quality

Emissions that may affect air quality are heavily regulated under the Clean Air Act and its implementing regulations, through a comprehensive federal/state regulatory process (see Section 3.1). Consistent with these regulatory requirements and processes, the Navy has implemented comprehensive air quality management programs to ensure compliance.

5.1.2 Expended Materials

Releases or discharges of hazardous materials are heavily regulated through comprehensive federal and state processes. In addition, the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) prohibits certain discharges of oil, garbage, and other substances from vessels. The MARPOL convention is implemented by national legislation, including the Act to Prevent Pollution from Ships (33 U.S.C. 1901, et seq.) and the Federal Water Pollution Control Act ("Clean Water Act"; 33 U.S.C. 1321, et seq.). These and other requirements are implemented by the *Navy Environmental and Natural Resources Program Manual* (DoN 2007) and related Navy guidance documents that require hazardous materials to be stored and handled appropriately, both onshore and afloat.

The Navy has also implemented hazardous materials management programs to ensure compliance and provide guidance on handling and disposing of such materials. Navy instructions include stringent discharge, storage, and pollution prevention measures and require facility managers to reduce, to the extent possible, quantities of toxic substances released into the environment. All Navy vessels and facilities have comprehensive programs in place that implement responsible stewardship, hazardous materials management and minimization, pollution prevention, recycling, and spill prevention and response. These and other programs allow Navy ships to retain used and excess hazardous material on

board for shore offload within 5 working days of arrival at a Navy port. All activities can return excess and unused hazardous materials to the Navy's Hazardous Material Minimization Centers. Additional information regarding water discharge restrictions for Navy vessels is provided in Table 5-1, Water Resources.

5.1.3 Water Resources

Environmental compliance policies and procedures applicable to operations ashore and at sea are identified in Navy instructions that include directives regarding waste management, pollution prevention, and recycling. The protective measures implemented by the Navy for water resource protection are commonly referred to as Standard Operating Procedures (SOPs) and Best Management Practices (BMPs). Measures that reduce potential impacts to water resources include creation and adherence to storm water management plans, erosion control, maintaining vegetative buffers adjacent to waterways, and enforcement of pollution permit requirements (National Pollutant Discharge Elimination System [NPDES]).

At sea, Navy vessels are required to operate in a manner that minimizes or eliminates any adverse impacts to the marine environment. Environmental compliance policies and procedures applicable to shipboard operations afloat are defined in the *Navy Environmental and Natural Resources Program Manual* (DoN 2007), Chapter 4, "Pollution Prevention," and Chapter 22, "Environmental Compliance Afloat"; Department of Defense (DoD) Instruction 5000.2-R (§C5.2.3.5.10.8, "Pollution Prevention"). In addition, provisions in Executive Order (EO) 12856, *Federal Compliance With Right-To-Know Laws and Pollution Prevention Requirements*, and EO 13101, *Greening the Government through Waste Prevention, Recycling, and Federal Acquisition* reinforce the Clean Water Act's (CWA's) prohibition against discharge of harmful quantities of hazardous substances into or upon U.S. waters out to 200 nautical miles (nm) (371 kilometers [km]), and mandate stringent hazardous waste discharge, storage, dumping, and pollution prevention requirements. Table 5-1 provides information on Navy SOPs and BMPs for shipboard management, storage, and discharge of hazardous materials and wastes, and on other pollution protection measures intended to protect water quality. Although not applicable to the Gulf of Alaska (GOA) Navy Training Activities EIS/OEIS, onshore policies and procedures related to spills of oil and hazardous materials are detailed in OPNAVISNT 5090.1C, Chapter 12.

Shipboard waste-handling procedures governing the discharge of nonhazardous waste streams have been established for commercial and Navy vessels. These categories of wastes include solids (garbage) and liquids such as "black water" (sewage), "gray water" (water from deck drains, showers, dishwashers, laundries, etc.), and oily wastes (oil-water mixtures). Table 5-1 summarizes the waste stream discharge restrictions for Navy vessels at sea.

Table 5-1: Waste Discharge Restrictions for Navy Vessels

Zone (nm from shore)	Type of Waste	
	Black Water (Sewage)	**Gray Water**
U.S. Waters (0-3 nm)	No discharge.	If vessel is equipped to collect gray water, pump out when in port. If no collection capability exists, direct discharge permitted.
U.S. Contiguous Zone (3-12 nm)	Direct discharge permitted.	Direct discharge permitted.
>12 nm from shore	Direct discharge permitted.	Direct discharge permitted.
Zone	**Oily Waste**	
U.S. Waters (0-3 nm)	Discharge allowed if waste has no visible sheen. If equipped with Oil Content Monitor (OCM), discharge < 15 ppm oil.	
U.S. Contiguous Zone (3-12 nm)	Same as 0-3 nm.	
>12 nm from shore	If equipped with OCM, discharge < 15 ppm oil. Vessels with oil/water separator but no OCM must process all bilge water through the oil-water separator.	
Zone	**Garbage (Plastic)**	**Garbage (Non-plastic)**
U.S. Waters (0-3 nm)	No discharge.	No discharge.
U.S. Contiguous Zone (3-12 nm)	No discharge.	Pulped or comminuted food and pulped paper and cardboard waste may be discharged >3nm.
12-25 nm from shore	No discharge.	Bagged shredded glass and metal waste may be discharged >12nm[1]
> 25 nm from shore	No discharge.	Direct discharge permitted[2].

Note: (1) Submarines may discharge compacted, sinkable garbage between 12 nm and 25 nm provided that the depth of water is greater than 1,000 fathoms.

(2) Surface ships shall use pulpers and shredders for all discharges of food products, paper, cardboard, glass and metal wastes

Source: DoN 2007

5.1.4 Acoustic Environment (Airborne)

Navy activities in the TMAA comply with numerous established acoustic control procedures to ensure that neither participants nor non-participants engage in activities that would endanger life or property. SOPs for minimizing airborne noise impacts in the TMAA are mainly centered on aircraft SOPs.

Aircraft SOPs are largely oriented toward safety, which also provide significant noise abatement benefits. For example, many SOPs involve flight routing and minimum altitudes. Each of these procedures increases the range of the noise source from human receptors, thus reducing noise impacts. Additionally, each aircrew will be familiar with the noise profiles of their aircraft and shall be committed to minimizing noise impacts without compromising operational and safety requirements. Flights of naval aircraft shall be conducted so that a minimum of annoyance is experienced by persons that may be below. It is not enough for the pilot to be satisfied that no person is actually endangered. Definite and particular effort shall be taken to fly in such a manner that individuals do not believe they or their property are endangered.

Military personnel who might be exposed to sound in the air from military activities, such as military aircraft or at sea explosions heard on the surface of the ocean, are required to take precautions, such as the wearing of protective equipment, to reduce or eliminate potential harmful effects of such exposure. With regard to potential exposure of non-military personnel in the ocean, precautions are taken pursuant to SOPs to prevent such exposure. These include advance notice of scheduled training activities to the public and the commercial fishing community via the worldwide web, Notices to Mariners (NOTMARs), and Notices to Airmen (NOTAMs). In addition, range safety SOPs ensure that civilians are excluded from, and if necessary removed from areas of military activities, or that military activities do not occur when civilians are present. These procedures have proven to be effective at minimizing potential military / civilian interactions in the course of training or other military activities.

5.1.5 Marine Plants and Invertebrates

The Navy has no existing protective measures in place specifically for marine plants and invertebrates. However, Seamount Habitat Protection Areas and Slope Conservation Areas (which comprise HAPCs or generally Conservation Areas) throughout the GOA restrict groundfish harvest to minimize harmful impacts of fishing methodology and equipment to ocean bottom habitat (Witherell 2004). Additionally, marine plants and invertebrates benefit from measures in place to protect marine mammals and sea turtles (see Section 5.2.1).

Subsequently, the buffer zones that have been established to reduce or eliminate potential effects of Navy activities on marine mammals serve to reduce or eliminate potential effects on marine plants and invertebrates as well. The buffer zones for marine mammals have been designated for training events using both explosive and nonexplosive ordnance. Lookouts are posted to visually survey for floating kelp, plants, or algal mats which are objects to which sea turtles and other marine mammals are drawn. For training activities using explosive ordnance, the intended impact area shall not be within 600 yards (yd) (585 meters [m]) of known or observed kelp beds, floating plants, or algal mats. For training events using nonexplosive ordnance, intended impact area shall not be within 200 yd (183 m) of known or observed kelp beds, floating plants, or algal mats. For air-to-surface missile exercises, the buffer zone is extended to 1,800 yd (1,646 m) around hard bottom communities, kelp forests, floating plants, and algal mats, for both explosive and nonexplosive ordnance.

5.1.6 Fish

Mitigation measures for at-sea activities involving explosive ordnance, implemented for marine mammals and sea turtles, also offer protections to habitats associated with fish communities. No additional mitigation measures are proposed or warranted because no substantial effects on fish or fish habitat were identified.

5.1.7 Birds

The majority of aircraft activities that might affect seabirds are concentrated within the TMAA where the potential for bird aircraft strikes exists. Pursuant to Navy instruction (OPNAVINST 3750.6R), measures to evaluate and reduce or eliminate this hazard to aircraft, aircrews, and birds are implemented during activities in the TMAA. Additionally, guidance involving land or at sea activities involving explosive ordnance contains instructions to personnel to observe the surrounding area within 700 yd (640 m) for 30 minutes prior to detonation. If birds (or marine mammals or sea turtles) are seen, the activity must be relocated to an unoccupied area or postponed until animals leave the area. Monitoring of seabird populations and colonies by conservation groups and researchers is conducted intermittently within coastal areas and offshore islands with limited support from various military commands.

5.1.8 Cultural Resources

Section 3.10 details protective measures implemented with regard to cultural resources in the TMAA. There are no prehistoric or historic archaeological resources, architectural resources, or traditional cultural properties identified within the TMAA, but there are submerged cultural resources. Within the TMAA, these submerged cultural resources are unaffected by Navy activities because of the type of training activities and the low density of submerged cultural resources.

The Navy has established protective measures to reduce potential effects on cultural and natural resources from training activities. Some are generally applicable, while others apply to particular geographic areas during specific times of year for certain types of Navy training activities. These measures are based on environmental analyses conducted by the Navy for coastal waters and for land and sea ranges.

Most of these protective measures are focused on protection of the natural environment. Such protective measures also benefit culturally valued natural resources such as salmon and shellfish. Some of the protective measures include use of inert ordnance and passive tracking and acoustical tools, avoidance of sensitive habitats, and visually monitoring areas to ensure significant concentrations of sea life are not present.

5.1.9 Transportation and Circulation

The Navy strives to ensure that it retains access to ocean training areas and special use airspace (SUA) as necessary to accomplish its mission, while facilitating joint military-civilian use of such areas to the extent practicable and consistent with safety. These goals of military access, joint use, and safety are promoted through various coordination and outreach measures, including:

- Publication of NOTAMs advising of the status and nature of activities being conducted in the TMAA and Warning Area (W)-612.
- Return of Special-Use Airspace (SUA) to civilian Federal Aviation Administration (FAA) control when not in use for military activities. To accommodate the joint use of SUA, a Letter of Agreement is in place between the military and the Anchorage Air Route Traffic Control Center (ARTCC). The Letter of Agreement defines the conditions and procedures to ensure safe and efficient joint use of the TMAA and Warning Area.
- Publication of NOTMARs and other outreach mechanism. The Navy provides information about training activities planned for the TMAA, for publication by the U.S. Coast Guard in NOTMARs.
- Developing methods of outreach with the fishing community.

5.1.10 Socioeconomics

Given the nature and location of Navy activities addressed in this EIS/OEIS, mitigation and protective measures are unnecessary with respect to socioeconomic considerations.

5.1.11 Environmental Justice and Protection of Children

Given the nature and location of Navy activities addressed in this EIS/OEIS, mitigation and protective measures are unnecessary with respect to environmental justice and protection of children considerations.

5.1.12 Public Safety

Navy activities in the TMAA comply with numerous established safety procedures to ensure the safety of participants and the public. Safety procedures for activities on the offshore and nearshore areas are published in multiple documents (DoN 1997, 1999, 2004) that are applicable to the TMAA. These guidelines are directive for users of the training areas. They provide, among other measures, that:

- Commanders are responsible for ensuring that impact areas and targets are clear prior to commencing activities that are hazardous.
- Aircraft or vessels expending ordnance shall not commence firing without permission of the scheduling authority for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
- Ships are authorized to fire their weapons only in offshore areas and at specific distances from land, depending on the caliber and range of the weapons fired.
- The use of pyrotechnic or illumination devices and marine markers such as smoke or dye markers will be allowed only in the assigned areas, to avoid the launch of Search and Rescue forces when not required. Aircraft carrying ordnance to or from ranges shall avoid populated areas to the maximum extent possible.
- Aircrews operating in the TMAA and W-612 are aware that nonparticipating aircraft are not precluded from entering the area and may not comply with a NOTAM or radio warning that hazardous activities are scheduled or occurring. Aircrews are required to maintain a continuous lookout for non-participating aircraft while operating under Visual Flight Rules (VFRs) in the TMAA or W-612.

In addition to the above-mentioned procedures, the Navy has instituted the following SOPs for use in the TMAA.

5.1.12.1 Aviation Safety

Potential hazardous activities conducted within the TMAA are conducted under VFR and under visual meteorological conditions. This means that the commanders of military aircraft are responsible for the safe conduct of their flight. Prior to releasing any weapons or ordnance, the impact area must be clear of non-participating vessels, people, or aircraft. The Officer Conducting the Exercise (OCE) is ultimately responsible for the safe conduct of range training. A qualified Safety Officer is assigned to each training event or exercises and can terminate activities if unsafe conditions exist.

5.1.12.2 Submarine Safety

Vertical separation of at least 100 ft (30.5 m) is required between the top of a submarine's sail and the depth of a surface ship's keel. If a submarine (or submarine simulated target, the MK-30) is at periscope depth, at least a 1,500 yd (1,372 m) horizontal separation from other vessels must be maintained.

5.1.12.3 Surface Ship Safety

During training events, surface ships maintain radio contact with the OCE. Prior to launching a weapon, ships are required to obtain a "Green Range," which indicates that all safety criteria have been satisfied, and that the weapons and target recovery conditions and recovery helicopters and boats are ready to be employed.

5.1.12.4 Missile Exercise Safety

Safety is the top priority and paramount concern during missile exercises. These exercises can be surface-to-surface, subsurface-to-surface, surface-to-air, or air-to-air. A Missile Exercise (MISSILEX) Letter of Instruction is prepared prior to any missile firing exercise. This instruction establishes precise ground rules for the safe and successful execution of the exercise. Any MISSILEX participant who observes an unsafe situation can communicate a "Red Range" order over any voice communication systems. Range control is in radio contact with participants at all times during a MISSILEX.

5.2 MITIGATION MEASURES

As part of the Navy's commitment to sustainable use of resources and environmental stewardship, the Navy incorporates measures that are protective of the environment into all of its activities. These include employment of best management practices, standard operating procedures (SOPs), adoption of conservation recommendations, and other measures that mitigate the impacts of Navy activities on the environment. Some of these measures are generally applicable and others are designed to apply to certain geographic areas during certain times of year, for specific types of military training. Mitigation measures covering habitats and species occurring in the ATA have been developed through various environmental analyses conducted by the Navy for land and sea ranges and adjacent coastal waters.

The Navy has implemented a variety of marine mammal mitigation measures over the last two decades. The following discussion briefly describes the genesis and status of those mitigation measures.

The Navy has developed and implemented mitigation measures as a result of environmental analysis or in consultation with regulatory agencies for research, development, test, and evaluation activities (RDT&E) and training exercises involving various sonar systems. These measures included visual detection by trained lookouts, power down and shut down procedures, the use of passive sensors to detect marine mammals, and avoidance of marine mammals.

In December 2000, the Navy issued a memorandum entitled "Compliance with Environmental Requirements in the Conduct of Naval Exercises or Training at Sea" (DoN 2000). This memorandum clarified Navy policy for continued compliance with certain environmental requirements including preparation of environmental planning documents, consultations pursuant to the Endangered Species Act (ESA), and applications for "take" authorizations under the Marine Mammal Protection Act (MMPA).

In 2003, the Navy issued the Protective Measures Assessment Protocol (PMAP) that implemented Navy-wide mitigation measures for various types of routine training events. Following the implementation of PMAP, the Navy agreed to additional mitigation measures as part of MMPA authorization and ESA consultation processes for specific training exercises from 2004-2007.

This Section describes mitigation measures applicable to the military readiness activities described in Chapter 2 within the study area of the GOA Final EIS/OEIS.

5.2.1 Marine Mammals (and Sea Turtles)

The comprehensive suite of mitigation measures implemented by the Navy to reduce impacts to marine mammals also serves to mitigate potential impacts on sea turtles. In particular, personnel and watchstander training, establishment of turtle-free exclusion zones for at-sea explosions, and pre- and post-exercise surveys, all serve to reduce or eliminate potential impacts of Navy activities on sea turtles that may be present in the vicinity.

Effective training in the GOA dictates that ship, submarine, and aircraft participants utilize their sensors and exercise weapons to their optimum capabilities as required by the mission. This section is a comprehensive list of mitigation measures that would be utilized for training activities analyzed in the EIS/OEIS in order to minimize potential for impacts on marine mammals and sea turtles in the GOA.

Marine mammals may be exposed to sound energy levels sufficient to cause a physiological effect. As described in Section 3.8, specific received sound energy levels are associated with permanent threshold shift (PTS), a permanent hearing loss over a subsection of an animal's hearing range (injury); and with temporary threshold shift (TTS), a temporary hearing loss and associated behavioral disruption. Received sound energy level thresholds for PTS and TTS from exposure to mid-frequency sonar are 215 dB re

$1\mu Pa^2$-s and 195dB $1\mu Pa^2$-s respectively. The predicted ranges, or distances, to received sound energy levels associated with marine mammal PTS and TTS for the most powerful and the most commonly used shipboard mid-frequency active sonar used in the Gulf of Alaska are shown in Table 5-2.

Due to spreading loss, sound attenuates logarithmically from the source, so the area in which an animal could be exposed to potential injury (PTS) is small. Because the most powerful sources would typically be used in deep water and the range to effect is limited, spherical spreading is assumed for 195 decibels referenced to 1 micro-Pascal squared second (dB re $1\mu Pa^2$-s) and above. Also, due to the limited ranges, interactions with the bottom or surface ducts are rarely an issue.

Table 5-2. Range to Effects for Shipboard Mid-Frequency Active Sonar

Active Sonar Source	PTS level dB re $1\mu Pa^2$-s	Range to PTS (ft/m)	TTS level dB re $1\mu Pa^2$-s	Range To TTS (ft/m)
SQS-53 ship	215	33/10	195	459/140
SQS-56 ship	215	11/3.2	195	108/33

Current mitigation measures employed by the Navy include applicable training of personnel and implementation of activity specific procedures resulting in minimization and/or avoidance of interactions with protected resources.

5.2.1.1 General Maritime Measures

Personnel Training – Watchstanders and Lookouts

The use of shipboard lookouts is a critical component of all Navy mitigation measures. Navy shipboard lookouts (also referred to as "watchstanders") are highly qualified and experienced observers of the marine environment. Their duties require that they report all objects sighted in the water to the Officer of the Deck (OOD) (e.g., trash, a periscope, marine mammals, sea turtles) and all disturbances (e.g., surface disturbance, discoloration) that may be indicative of a threat to the vessel and its crew. There are personnel serving as lookouts on station at all times (day and night) when a ship or surfaced submarine is moving through the water.

- All Commanding Officers (COs), Executive Officers (XOs), lookouts, OODs, Junior OODs (JOODs), maritime patrol aircraft aircrews, and Anti-Submarine Warfare (ASW)/Mine Warfare (MIW) helicopter crews will complete the NMFS-approved Marine Species Awareness Training (MSAT) by viewing the U.S. Navy MSAT digital versatile disk (DVD). MSAT may also be viewed on-line at https://portal.navfac.navy.mil/go/msat. MSAT training must be reviewed at least annually and again prior to the first use of mid-frequency active (MFA) sonar and/or IEER during major ASW exercises (e.g., Composite Training Unit Exercise [COMPTUEX] and Rim of the Pacific Exercise [RIMPAC]). This training must be recorded in the individual's training record.

- Navy lookouts will undertake extensive training to qualify as a watchstander in accordance with the Lookout Training Handbook (Naval Education and Training Command [NAVEDTRA] 12968-D).
- Lookout training will include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training period, lookouts will complete the Personal Qualification Standard Program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects). Personnel being trained as lookouts can be counted among required lookouts as long as supervisors monitor their progress and performance.

- Lookouts will be trained in the most effective means to ensure quick and effective communication within the command structure to facilitate implementation of mitigation measures if marine species are spotted.
- Lookouts' ability to detect objects in the water, including marine mammals and sea turtles, is critical to Navy environmental compliance and will be evaluated by Navy and contracted biologists.

Operating Procedures & Collision Avoidance

- Prior to major exercises, a Letter of Instruction, Mitigation Measures Message or Environmental Annex to the Operational Order will be issued to further disseminate the personnel training requirement and general marine species mitigation measures.
- COs will make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible consistent with safety of the ship.
- While underway, surface vessels will have at least two lookouts with binoculars; surfaced submarines will have at least one lookout with binoculars. Lookouts already posted for safety of navigation and man-overboard precautions may be used to fill this requirement. As part of their regular duties, lookouts will watch for and report to the OOD the presence of marine mammals and sea turtles.
- On surface vessels equipped with a MFA sonar, pedestal mounted "Big Eye" (20x110) binoculars will be properly installed and in good working order to assist in the detection of marine mammals in the vicinity of the vessel.
- Personnel on lookout will employ visual search procedures employing a scanning methodology in accordance with the Lookout Training Handbook.
- After sunset and prior to sunrise, lookouts will employ Night Lookout Techniques in accordance with the Lookout Training Handbook.
- Personnel on lookout will be responsible for reporting all objects or anomalies sighted in the water (regardless of the distance from the vessel) to the OOD, since any object or disturbance (e.g., trash, periscope, surface disturbance, discoloration) in the water may be indicative of a threat to the vessel and its crew, or indicative of a marine species that may need to be avoided as warranted. Navy environmental compliance relies heavily on the abilities of lookouts to detect and avoid protected species. Therefore, it is critical that lookouts be vigilant in their reporting.
- While in transit, naval vessels will be alert at all times, use extreme caution, and proceed at a "safe speed" so that the vessel can take proper and effective action to avoid a collision with any marine animal and can be stopped within a distance appropriate to the prevailing circumstances and conditions.
- When sea turtles or marine mammals have been sighted in the area, Navy vessels will increase vigilance and take reasonable and practicable actions to avoid collisions and activities that might result in close interaction of naval assets and marine mammals. Actions may include changing speed and/or direction and are dictated by environmental and other conditions (e.g., safety, weather).
- Naval vessels will maneuver to keep at least 1,500 ft (500 yds) away from any observed whale in the vessel's path and avoid approaching whales head-on. These requirements do not apply if a vessel's safety is threatened, such as when change of course will create an imminent and serious threat to a person, vessel, or aircraft, and to the extent vessels are restricted in their ability to maneuver. Restricted maneuverability includes, but is not limited to, situations when vessels are

engaged in dredging, submerged activities, launching and recovering aircraft or landing craft, minesweeping activities, replenishment while underway and towing activities that severely restrict a vessel's ability to deviate course. Vessels will take reasonable steps to alert other vessels in the vicinity of the whale. Given rapid swimming speeds and maneuverability of many dolphin species, naval vessels would maintain normal course and speed on sighting dolphins unless some condition indicated a need for the vessel to maneuver.

- Floating weeds and kelp, algal mats, clusters of seabirds, and jellyfish are good indicators of marine mammals. Therefore, where these circumstances are present, the Navy will exercise increased vigilance in watching for marine mammals.
- Navy aircraft participating in exercises at sea will conduct and maintain, when operationally feasible and safe, surveillance for marine mammals as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties. Marine mammal detections will be immediately reported to assigned Aircraft Control Unit for further dissemination to ships in the vicinity of the marine species as appropriate when it is reasonable to conclude that the course of the ship will likely result in a closing of the distance to the detected marine mammal.
- All vessels will maintain logs and records documenting training operations should they be required for event reconstruction purposes.

5.2.1.2 Measures for Specific Training Events

Mid-Frequency Active Sonar Activities

General Maritime Mitigation Measures: Personnel Training

- All lookouts onboard platforms involved in ASW training events will review the NMFS-approved MSAT material prior to use of MFA sonar.
- All COs, XOs, and officers standing watch on the bridge will have reviewed the MSAT material prior to a training event employing the use of MFA sonar.
- Navy lookouts will undertake extensive training in order to qualify as a watchstander in accordance with the Lookout Training Handbook.
- Lookout training will include on-the-job instruction under the supervision of a qualified, experienced watchstander. Following successful completion of this supervised training period, lookouts will complete the Personal Qualification Standard program, certifying that they have demonstrated the necessary skills (such as detection and reporting of partially submerged objects). This does not forbid personnel being trained as lookouts from being counted as those listed in previous measures so long as supervisors monitor their progress and performance.
- Lookouts will be trained in the most effective means to ensure quick and effective communication within the command structure in order to facilitate implementation of mitigation measures if marine species are spotted.

General Maritime Mitigation Measures: Lookout and Watchstander Responsibilities

- On the bridge of surface ships, there will always be at least three people on watch whose duties include observing the water surface around the vessel.
- All surface ships participating in ASW training events will, in addition to the three personnel on watch noted previously, have at all times during the exercise at least two additional personnel on watch as lookouts.

- Personnel on lookout and officers on watch on the bridge will have at least one set of binoculars available for each person to aid in the detection of marine mammals.
- On surface vessels equipped with MFA sonar, pedestal mounted "Big Eye" (20x110) binoculars will be present and in good working order to assist in the detection of marine mammals in the vicinity of the vessel.
- Personnel on lookout will employ visual search procedures employing a scanning methodology in accordance with the Lookout Training Handbook.
- After sunset and prior to sunrise, lookouts will employ Night Lookout Techniques in accordance with the Lookout Training Handbook.
- Personnel on lookout will be responsible for reporting all objects or anomalies sighted in the water (regardless of the distance from the vessel) to the OOD, since any object or disturbance (e.g., trash, periscope, surface disturbance, discoloration) in the water may be indicative of a threat to the vessel and its crew or indicative of a marine species that may need to be avoided as warranted.

Operating Procedures

- A Letter of Instruction, Mitigation Measures Message, or Environmental Annex to the Operational Order will be issued prior to the exercise to further disseminate the personnel training requirement and general marine mammal mitigation measures.
- COs and OICs will make use of marine species detection cues and information to limit interaction with marine species to the maximum extent possible, consistent with safety of the ship.
- All personnel engaged in passive acoustic sonar operation (including aircraft, surface ships, or submarines) will monitor for marine mammal vocalizations and report the detection of any marine mammal to the appropriate watch station for dissemination and appropriate action.
- During MFA sonar operations, personnel will utilize all available sensor and optical systems (such as night vision goggles) to aid in the detection of marine mammals.
- Navy aircraft participating in exercises at sea will conduct and maintain, when operationally feasible and safe, surveillance for marine species of concern as long as it does not violate safety constraints or interfere with the accomplishment of primary operational duties.
- Aircraft with deployed sonobuoys will use only the passive capability of sonobuoys when marine mammals are detected within 200 yd (183 m) of the sonobuoy. Only the sonobuoys that are impacted by the mammal presence within 200 yd (183 m) need to be used in passive mode.
- Marine mammal detections will be immediately reported to assigned Aircraft Control Unit for further dissemination to ships in the vicinity of the marine species, as appropriate, where it is reasonable to conclude that the course of the ship will likely result in a closing of the distance to the detected marine mammal.
- Safety Zones—When marine mammals are detected by any means (aircraft, shipboard lookout, or acoustically) within 1,000 yd (914 m) of the sonar dome (the bow), the ship or submarine will limit active transmission levels to at least 6 decibels (dB) below normal operating levels. (A 6 dB reduction equates to a 75 percent power reduction. The reason is that decibel levels are on a logarithmic scale, not a linear scale. Thus, a 6 dB reduction results in a power level only 25 percent of the original power.)
    - Ships and submarines will continue to limit maximum transmission levels by this 6-dB factor until the animal has been seen to leave the 1,000 yd safety zone, has not been

detected for 30 minutes, or the vessel has transited more than 2,000 yd (1,829 m) beyond the location of the last detection.

- Should a marine mammal be detected within 500 yd (457 m) of the sonar dome, active sonar transmissions will be limited to at least 10 dB below the equipment's normal operating level. (A 10 dB reduction equates to a 90 percent power reduction from normal operating levels.) Ships and submarines will continue to limit maximum ping levels by this 10-dB factor until the animal has been seen to leave the 500 yd safety zone, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yd (1,829 m) beyond the location of the last detection.
- Should the marine mammal be detected within 200 yd (183 m) of the sonar dome, active sonar transmissions will cease. Sonar will not resume until the animal has been seen to leave the 200 yd safety zone, has not been detected for 30 minutes, or the vessel has transited more than 2,000 yd (1,829 m) beyond the location of the last detection.
- Special conditions applicable for dolphins and porpoises only: If, after conducting an initial maneuver to avoid close quarters with dolphins or porpoises, the OOD concludes that dolphins or porpoises are deliberately closing to ride the vessel's bow wave, no further mitigation actions are necessary while the dolphins or porpoises continue to exhibit bow wave riding behavior.
- If the need for power-down should arise as detailed in "Safety Zones" above, the Navy will follow the requirements as though they were operating at 235 dB, the normal operating level (i.e., the first power-down will be to 229 dB, regardless of at what level above 235 dB active sonar was being operated).

- Prior to start up or restart of active sonar, operators will check that the Safety Zone radius around the sound source is clear of marine mammals.
- Active sonar levels (generally)—Navy will operate active sonar at the lowest practicable level, not to exceed 235 dB, except as required to meet tactical training objectives.
- Helicopters will observe/survey the vicinity of an ASW training event for 10 minutes before the first deployment of active (dipping) sonar in the water.
- Helicopters will not dip their active sonar within 200 yd (183 m) of a marine mammal and will cease pinging if a marine mammal closes within 200 yd (183 m) after pinging has begun.
- Submarine sonar operators will review detection indicators of close-aboard marine mammals prior to the commencement of ASW training events involving MFA sonar.
- Night vision goggles will be available to all ships and air crews, for use as appropriate.
- Increased vigilance during major ASW training exercise with tactical active sonar when critical conditions are present.

Surface-to-Surface Gunnery (up to 5-inch explosive rounds)

- Lookouts will visually survey for floating weeds and kelp. Intended impact (i.e., where the Navy is aiming) will not be within 600 yd (549 m) of known or observed floating weeds and kelp, and algal mats.
- A 600 yd (549 m) radius buffer zone will be established around the intended target.
- From the intended firing position, lookouts will survey the buffer zone for marine mammals prior to commencement and during the exercise as long as practicable.

- For exercises using targets towed by a vessel or aircraft, target-towing vessels/aircraft will maintain a trained lookout for marine mammals, if applicable. If a marine mammal is sighted in the vicinity, the tow aircraft/vessel will immediately notify the firing vessel, which will suspend the exercise until the area is clear.
- The exercise will be conducted only when the buffer zone is visible and marine mammals are not detected within it.

Surface-to-Surface Gunnery (nonexplosive rounds)

- Lookouts will visually survey for floating weeds and kelp, and algal mats. Intended impact will not be within 200 yd (183 m) of known or observed floating weeds and kelp, and algal mats.
- A 200 yd (183 m) radius buffer zone will be established around the intended target.
- From the intended firing position, trained lookouts will survey the buffer zone for marine mammals prior to commencement and during the exercise as long as practicable.
- If applicable, target towing vessels will maintain a lookout. If a marine mammal is sighted in the vicinity of the exercise, the tow vessel will immediately notify the firing vessel in order to secure gunnery firing until the area is clear.
- The exercise will be conducted only when the buffer zone is visible and marine mammals are not detected within the target area and the buffer zone.

Surface-to-Air Gunnery (explosive and nonexplosive rounds)

- Vessels will orient the geometry of gunnery exercises in order to prevent military expended material from falling in the area of sighted marine mammals.
- Vessels will expedite the recovery of any parachute deploying aerial targets to reduce the potential for entanglement of marine mammals.
- Target towing aircraft will maintain a lookout, if applicable. If a marine mammal is sighted in the vicinity of the exercise, the tow aircraft will immediately notify the firing vessel in order to secure gunnery firing until the area is clear.

Air-to-Surface Gunnery (explosive and nonexplosive rounds)

- If surface vessels are involved, lookouts will visually survey for floating kelp in the target area. Impact will not occur within 200 yd (183 m) of known or observed floating weeds and kelp or algal mats.
- A 200 yd (183 m) radius buffer zone will be established around the intended target.
- If surface vessels are involved, lookout(s) will visually survey the buffer zone for marine mammals prior to and during the exercise.
- Aerial surveillance of the buffer zone for marine mammals will be conducted prior to commencement of the exercise. Aircraft crew/pilot will maintain visual watch during exercises. Release of ordnance through cloud cover is prohibited, aircraft must be able to actually see ordnance impact areas.
- The exercise will be conducted only if marine mammals are not visible within the buffer zone.

Air-to-Surface At-Sea Bombing Exercises (explosive and nonexplosive bombs)

- If surface vessels are involved, trained lookouts will survey for floating kelp and marine mammals. Ordnance will not be targeted to impact within 1,000 yd (914 m) of known or observed floating kelp or marine mammals.
- A 1,000 yd (914 m) radius buffer zone will be established around the intended target.
- Aircraft will visually survey the target and buffer zone for marine mammals prior to and during the exercise. The survey of the impact area will be made by flying at 1,500 ft (457 m) or lower, if safe to do so, and at the slowest safe speed. Release of ordnance through cloud cover is prohibited, aircraft must be able to actually see ordnance impact areas. Survey aircraft should employ most effective search tactics and capabilities.
- The exercises will be conducted only if marine mammals are not visible within the buffer zone.

Air-to-Surface Missile Exercises (explosive and nonexplosive)

- Ordnance will not be targeted to impact within 1,800 yd (1,646 m) of known or observed floating kelp.
- Aircraft will visually survey the target area for marine mammals. Visual inspection of the target area will be made by flying at 1,500 ft (457 m) or lower, if safe to do so, and at slowest safe speed. Firing or range clearance aircraft must be able to actually see ordnance impact areas. Explosive ordnance will not be targeted to impact within 1,800 yd (1646 m) of sighted marine mammals.

Sinking Exercise (SINKEX)

The selection of sites suitable for SINKEX involves a balance of operational suitability and requirements established under the Marine Protection, Research and Sanctuaries Act (MPRSA) permit granted to the Navy (40 Code of Federal Regulations § 229.2). To meet operational suitability criteria, locations must be within a reasonable distance of the target vessels' originating locations. The locations should also be close to active military bases to allow participating assets access to shore facilities. For safety purposes, these locations should also be in areas that are not generally used by non-military air or watercraft. The MPRSA permit requires vessels to be sunk in waters which are at least 1,000 fathoms (6,000 ft [2,000 yds/1,829 m]) deep and at least 50 nm (92.6 km) from land.

In general, most marine mammals prefer areas with strong bathymetric gradients and oceanographic fronts for significant biological activity such as feeding and reproduction. Typical locations include the continental shelf and shelf-edge.

SINKEX Mitigation Plan

The Navy has developed range clearance procedures to maximize the probability of sighting any ships or marine mammals in the vicinity of an exercise, which are as follows:

- All weapons firing will be conducted during the period one hour after official sunrise to 30 minutes before official sunset.
- Extensive range clearance operations would be conducted in the hours prior to commencement of the exercise, ensuring that no shipping is located within the hazard range of the longest-range weapon being fired for that event.
- An exclusion zone with a radius of 1.5 nm will be established around each target. This 1.5 nm zone includes a buffer of 0.5 nm to account for errors, target drift, and animal movement. In addition to the 1.5 nm exclusion zone, a further safety zone, which extends from the exclusion

zone at 1.5 nm out an additional 0.5 nm, will be surveyed. Together, the zones (exclusion and safety) extend out 2 nm from the target.

- A series of surveillance over-flights will be conducted within the exclusion and the safety zones, prior to and during the exercise, when feasible. Survey protocol will be as follows:
    - Overflights within the exclusion zone will be conducted in a manner that optimizes the surface area of the water observed. This may be accomplished through the use of the Navy's Search and Rescue Tactical Aid, which provides the best search altitude, ground speed, and track spacing for the discovery of small, possibly dark objects in the water based on the environmental conditions of the day. These environmental conditions include the angle of sun inclination, amount of daylight, cloud cover, visibility, and sea state.
    - All visual surveillance activities will be conducted by Navy personnel trained in visual surveillance. At least one member of the mitigation team will have completed the Navy's marine mammal training program for lookouts.
    - In addition to the overflights, the exclusion zone will be monitored by passive acoustic means when assets are available. This passive acoustic monitoring would be maintained throughout the exercise. Potential assets include sonobuoys, which can be utilized to detect any vocalizing marine mammals (particularly sperm whales) in the vicinity of the exercise. The sonobuoys will be re-seeded as necessary throughout the exercise. Additionally, passive sonar onboard submarines may be utilized to detect any vocalizing marine mammals in the area. The OCE would be informed of any aural detection of marine mammals and would include this information in the determination of when it is safe to commence the exercise.
    - On each day of the exercise, aerial surveillance of the exclusion and safety zones will commence two hours prior to the first firing.
    - The results of all visual, aerial, and acoustic searches will be reported immediately to the OCE. No weapons launches or firing may commence until the OCE declares the safety and exclusion zones free of marine mammals.
    - If a protected species observed within the exclusion zone is diving, firing will be delayed until the animal is re-sighted outside the exclusion zone, or 30 minutes have elapsed. After 30 minutes, if the animal has not been re-sighted it would be assumed to have left the exclusion zone.
    - During breaks in the exercise of 30 minutes or more, the exclusion zone will again be surveyed for any protected species. If marine mammals are sighted within the exclusion zone, the OCE would be notified, and the procedure described above would be followed.
    - Upon sinking of the vessel, a final surveillance of the exclusion zone will be monitored for two hours, or until sunset, to verify that no marine mammals were harmed.
- Aerial surveillance will be conducted using helicopters or other aircraft based on necessity and availability. The Navy has several types of aircraft capable of performing this task; however, not all types are available for every exercise. For each exercise, the available asset best suited for identifying objects on and near the surface of the ocean would be used. These aircraft would be capable of flying at the slow safe speeds necessary to enable viewing of marine vertebrates with unobstructed, or minimally obstructed, downward and outward visibility. The exclusion and safety zone surveys may be cancelled in the event that a mechanical problem, emergency search and rescue, or other similar and unexpected event preempts the use of one of the aircraft onsite for the exercise.

- Where practicable, the Navy will conduct the exercise in sea states that are ideal for marine mammal sighting, i.e., Beaufort Sea State Level 3 or less. In the event of a Level 4 or above, survey efforts will be increased within the exercise area. This will be accomplished through the use of an additional aircraft, if available, and conducting tight search patterns.
- The exercise will not be conducted unless the exclusion zone can be adequately monitored visually.
- In the event that any marine mammals are observed to be harmed in the area, a detailed description of the animal will be taken, the location noted, and if possible, photos taken. This information will be provided to NMFS via the Navy chain of command for purposes of identification (see the Stranding Plan for detail).
- An after action report detailing the exercise time line, the time the surveys commenced and terminated, amount, and types of all ordnance expended, and the results of survey efforts for each event will be submitted to NMFS.

Mitigation Measures Related to Explosive Source Sonobuoys (AN/SSQ-110A)

AN/SSQ-110A Pattern Deployment

- Crews will conduct visual reconnaissance of the drop area prior to laying their intended sonobuoy pattern. This search will be conducted below 1,500 ft (457 m) at a slow speed, if operationally feasible and weather conditions permit. In dual aircraft operations, crews are allowed to conduct coordinated area clearances.
- Crews will conduct a minimum of 30 minutes of visual and aural monitoring of the search area prior to commanding the first post (source/receiver sonobuoy pair) detonation. This 30-minute observation period may include pattern deployment time.
- For any part of the briefed pattern where a post (source/receiver sonobuoy pair) will be deployed within 1,000 yd (914 m) of observed marine mammal activity, the Navy will deploy the receiver ONLY and monitor while conducting a visual search. When marine mammals are no longer detected within 1,000 yd (914 m) of the intended post position, the Navy will co-locate the explosive source sonobuoys (AN/SSQ-110A) (source) with the receiver.
- When able, Navy crews will conduct continuous visual and aural monitoring of marine mammal activity. This is to include monitoring of aircraft sensors from first sensor placement to checking off-station and out of Radio Frequency (RF) range of these sensors.

AN/SSQ-110A Pattern Employment

- Aural Detection:
    - If the presence of marine mammals is detected aurally, then that will cue the Navy aircrew to increase the diligence of their visual surveillance.
    - Subsequently, if no marine mammals are visually detected, then the crew may continue multi-static active search.
- Visual Detection:

  If marine mammals are visually detected within 1,000 yd (914 m) of the explosive source sonobuoys (AN/SSQ-110A) intended for use, then that payload will not be detonated. Aircrews may utilize this post once the marine mammals have not been re-sighted for 30 minutes, or are observed to have moved outside the 1,000 yd (914 m) safety buffer. Aircrews may shift their multi-static active search to another post where marine mammals are outside the 1,000 yd (914 m) safety buffer.

AN/SSQ-110A Scuttling Sonobuoys

- Aircrews will make every attempt to manually detonate the unexploded charges at each post in the pattern prior to departing the operations area by using the "Payload 1 Release" command, followed by the "Payload 2 Release" command. Aircrews will refrain from using the "Scuttle" command when two payloads remain at a given post. Aircrews will ensure a 1,000 yd (914 m) safety buffer, visually clear of marine mammals, is maintained around each post as is done during active search operations.
- Aircrews will only leave posts with unexploded charges in the event of a sonobuoy malfunction, an aircraft system malfunction, or when an aircraft must immediately depart the area due to issues such as fuel constraints, inclement weather, and in-flight emergencies. In these cases, the sonobuoy will self-scuttle using the secondary or tertiary method.
- The Navy will ensure all payloads are accounted for. Explosive source sonobuoys (AN/SSQ-110A) that cannot be scuttled will be reported as unexploded ordnance via voice communications while airborne, then upon landing via naval message.
- Mammal monitoring will continue until out of own-aircraft sensor range.

5.2.1.3 Conservation Measures

Monitoring: Integrated Comprehensive Monitoring Program

The U.S. Navy is committed to demonstrating environmental stewardship while executing its National Defense mission and is responsible for compliance with a suite of federal environmental and natural resources laws and regulations that apply to the marine environment. As part of those responsibilities, an assessment of the long-term and/or population-level effects of Navy training activities as well as the efficacy of mitigation measures is necessary. The Navy is developing an Integrated Comprehensive Monitoring Program (ICMP) for marine species in order to assess the effects of training activities on marine species and investigate population trends in marine species distribution and abundance in various range complexes and geographic locations where Navy training occurs. This program will emphasize active sonar training.

The primary goals of the ICMP are to:

- Monitor Navy training events, particularly those involving MFA sonar and at sea explosions, for compliance with the terms and conditions of Endangered Species Act (ESA) Section 7 consultations or Marine Mammal Protection Act (MMPA) authorizations;
- Collect data to support estimating the number of individuals exposed to sound levels above current regulatory thresholds;
- Assess the efficacy of the Navy's current marine species mitigation;
- Add to the knowledge base on potential behavioral and physiological effects to marine species from mid-frequency active sonar and at-sea explosions; and,
- Assess the practicality and effectiveness of a number of mitigation tools and techniques (some not yet in use).

Adaptive Management

Adaptive management principles consider appropriate adjustments to mitigation, monitoring, and reporting as the outcomes of the proposed actions and required mitigation are better understood. NMFS includes adaptive management principles in the regulations for the implementation of the proposed action, and any adaptive adjustments of mitigation and monitoring would be led by NMFS via the MMPA process and developed in coordination with the Navy. Continued opportunity for public input would be

included via the MMPA process, as appropriate (i.e. via the "Letter of Authorization" process). The intent of adaptive management here is to ensure the continued proper implementation of the required mitigation measures, to conduct appropriate monitoring and evaluation efforts, and to recommend possible adjustments to the mitigation/monitoring/reporting to accomplish the established goals of the mitigation and monitoring which include:

Mitigation

- Avoidance or minimization of injury or death of marine mammals wherever possible,
- A reduction in the numbers of marine mammals (total number or number at biologically important time or location) exposed to received levels of sound associated with the proposed active sonar activities,
- A reduction in the number of times (total number or number at biologically important time or location) individuals would be exposed to received levels,
- A reduction in the intensity of exposures (either total number or number at biologically important time or location) to received levels,
- A reduction in effects to marine mammal habitat, paying special attention to the food base, activities that block or limit passage to or from biologically important areas, permanent destruction of habitat, or temporary destruction/disturbance of habitat during a biologically important time, and
- For monitoring directly related to mitigation—an increase in the probability of detecting marine mammals, thus allowing for more effective implementation of the mitigation measures (shut-down zone, etc.).

Monitoring

- An increase in the probability of detecting marine mammals, both within the safety zone (thus allowing for more effective implementation of the mitigation) and in general to generate more data to contribute to the effects analyses.
- An increase in our understanding of how many marine mammals are likely to be exposed to levels of MFA sonar/High-Frequency Active (HFA) sonar (or explosives or other stimuli) that we associate with specific adverse effects, such as behavioral harassment, Temporary Threshold Shift (TTS), or Permanent Threshold Shift (PTS).
- An increase in our understanding of how marine mammals respond to MFA sonar/HFA sonar (at specific received levels), explosives, or other stimuli expected to result in take and how anticipated adverse effects on individuals (in different ways and to varying degrees) may impact the population, species, or stock (specifically through effects on annual rates of recruitment or survival).
- An increased knowledge of the affected species.
- An increase in our understanding of the effectiveness of certain mitigation and monitoring measures.

Generally speaking, adaptive management supports the integration of NEPA's principles into the ongoing implementation and management of the Proposed Action, including a process for improving, where needed, the effectiveness of the identified mitigations. Note that any adjustment of mitigation and monitoring would be within the scope of the environmental analyses and considerations presented in this EIS/OEIS.

Research

The Navy provides a significant amount of funding and support to marine research. In the past 5 years the agency funded over $100 million ($26 million in Fiscal Year [FY] 08 alone) to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals. The U.S. Navy sponsors 70 percent of all U.S. research concerning the effects of human-generated sound on marine mammals and 50 percent of such research conducted worldwide. Major topics of Navy-supported research include the following:

- Better understanding of marine species distribution and important habitat areas,
- Developing methods to detect and monitor marine species before and during training,
- Understanding the effects of sound on marine mammals, sea turtles, fish, and birds, and
- Developing tools to model and estimate potential effects of sound.

This research is directly applicable to Fleet training activities, particularly with respect to the investigations of the potential effects of underwater noise sources on marine mammals and other protected species. Proposed training activities employ active sonar and at-sea explosions, which introduce sound into the marine environment.

The Marine Life Sciences Division of the Office of Naval Research currently coordinates six programs that examine the marine environment and are devoted solely to studying the effects of noise and/or the implementation of technology tools that will assist the Navy in studying and tracking marine mammals. The six programs are as follows:

- Environmental Consequences of Underwater Sound,
- Non-Auditory Biological Effects of Sound on Marine Mammals,
- Effects of Sound on the Marine Environment,
- Sensors and Models for Marine Environmental Monitoring,
- Effects of Sound on Hearing of Marine Animals, and
- Passive Acoustic Detection, Classification, and Tracking of Marine Mammals.

The Navy has also developed the technical reports referenced within this document, including the Marine Resource Assessment. Furthermore, research cruises by the National Marine Fisheries Service (NMFS) and by academic institutions have received funding from the U.S. Navy. For example, in April 2009, the Navy funded a vessel-based line-transect survey in the GOA on board the NOAA ship *Oscar Dyson* to determine marine mammal species distribution and abundance. The survey cruise employed multiple observation techniques, including visual and passive acoustic observations, as well as photographic identifications (Rone et al. 2009).

The Navy has sponsored several workshops to evaluate the current state of knowledge and potential for future acoustic monitoring of marine mammals. The workshops brought together acoustic experts and marine biologists from the Navy and other research organizations to present data and information on current acoustic monitoring research efforts and to evaluate the potential for incorporating similar technology and methods on instrumented ranges. However, acoustic detection, identification, localization, and tracking of individual animals still requires a significant amount of research effort to be considered a reliable method for marine mammal monitoring. The Navy supports research efforts on acoustic monitoring and will continue to investigate the feasibility of passive acoustics as a potential mitigation and monitoring tool.

Overall, the Navy will continue to fund ongoing marine mammal research, and is planning to coordinate long term monitoring/studies of marine mammals on various established ranges and operating areas. The Navy will continue to research and contribute to university/ external research to improve the state of the science regarding marine species biology and acoustic effects. These efforts include mitigation and monitoring programs; data sharing with NMFS and via literature for research and development efforts; and future research as described previously.

5.2.1.4 Monitoring: GOA TMAA Marine Species Monitoring Plan

The U.S. Navy has developed a GOA TMAA Monitoring Plan to provide marine mammal and sea turtle monitoring as required under the MMPA of 1972 and the ESA of 1973. In order to issue an Incidental Take Authorization (ITA) for an activity, Section 101(a) (5) (a) of the MMPA states that NMFS must set forth "requirements pertaining to the monitoring and reporting of such taking". The MMPA implementing regulations at 50 CFR Section 216.104 (a) (13) note that requests for Letters of Authorization (LOAs) must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present.

The GOA TMAA Monitoring Plan proposes monitoring goals for marine mammals that are unique with regard to their breadth as well as their focus on potential impacts of mid-frequency active sonar (MFAS) and at-sea explosions on marine mammals and sea turtles. To accomplish these goals, the Navy will use similar methods of implementation and data analysis which have demonstrated success in comparable monitoring programs studying the effects of anthropogenic sound on marine animals. To this end, the Navy in consultation with NMFS designed a series of focused "study questions" to gather data in various combinations within the Navy's range complexes to address:

- Question 1. Are marine mammals and sea turtles exposed to mid-frequency active sonar (MFAS), especially at levels associated with adverse effects (i.e., based on NMFS' criteria for behavioral harassment, TTS, or PTS)? If so, at what levels are they exposed?

- Question 2. If marine mammals and sea turtles are exposed to MFAS in the TMAA, do they redistribute geographically as a result of continued exposure? If so, how long does the redistribution last?

- Question 3. If marine mammals and sea turtles are exposed to MFAS, what are their behavioral responses to various levels?

- Question 4. What are the behavioral responses of marine mammals and sea turtles that are exposed to explosives at specific levels?

- Question 5. Is the Navy's suite of mitigation measures for MFAS and explosives (e.g., Protective Measures Assessment Protocol [PMAP]), major exercise measures agreed to by the Navy through permitting) effective at avoiding TTS, injury, and mortality of marine mammals and sea turtles?

Given the larger scope of training events within other Navy range complexes as compared to GOA, not every one of these original five study questions will be addressed within the TMAA. Rather, data collected from the GOA TMAA monitoring will be used to supplement a consolidated range complex marine mammal monitoring report incorporating data from the Atlantic Fleet Active Sonar Training Range, Hawaii Range Complex, Northwest Training Range Complex, Marianna Islands Range Complex, and Southern California (SOCAL) Range Complex.

Monitoring methods proposed for the TMAA include use of passive acoustic monitoring to primarily focus on providing additional data for study questions 2, 3, and 4. In addition, in April of 2009, the Navy contributed approximately $150,000 in funding to support a NMFS marine mammal density survey of the offshore waters in GOA. The goal of this validation monitoring was increase the state of awareness on marine mammal occurrence, density, and distribution within GOA, an area that has not had significant visual survey effort. In addition to the U.S. Pacific Fleet funded monitoring initiative, the Chief of Naval Operations (CNO) Environmental Readiness Division and the Office of Naval Research (ONR) have developed a coordinated Science & Technology and Research & Development program focused on marine mammals and sound. Total investment in this program from 2004-2008 was $100 million. FY09 funding was $22 million. Continued funding at levels greater than $14 million is foreseen in subsequent years (2010 and beyond).

This GOA TMAA Monitoring Plan has been designed to attempt gathering data on all species of marine mammals and sea turtles observed in the TMAA study area. However, the Navy will prioritize monitoring efforts for species based on regulatory requirement due to ESA-listing, and on non-ESA-listed beaked whales. Therefore, offshore species for study within the Monitoring Plan that regularly occur within TMAA will be prioritized for research as follows:

- Beaked whale species (Baird's beaked whale, Cuvier's beaked whale, Stejneger's beaked whale)
- ESA-listed cetacean species (blue whale, fin whale, humpback whale, North Pacific right whale, sei whale, and sperm whale)

As an adaptive management strategy, the GOA TMAA Monitoring Plan will integrate elements from Navy-wide marine mammal research into the regional monitoring and data analysis proposed in this Plan when new technologies and techniques become available. Specific areas within the TMAA will be selected after consultations with NMFS and the regional science community for the most appropriate monitoring technique. Each monitoring technique has advantages and disadvantages that vary temporally and spatially, as well as support one particular study objective better than another. Given potential sea states and ocean conditions during winter, and the relatively infrequent Navy presence in the GOA, passive acoustic monitoring represents the best current technique to employ within the TMAA. There may be a number of potential additional marine mammal monitoring techniques, or variations of those already described, that could be attempted under this Plan. Future modifications to the TMAA Monitoring Plan may include integration of additional marine mammal monitoring techniques and research as either new technology or new information becomes available. As part of future dialogue to begin in the summer of 2010 with NMFS marine mammal scientists, Alaska academic scientists, and other subject matter experts with extensive field monitoring experience, the Navy will continually solicit input and recommendations to this Plan. An annual formal review with NMFS is being proposed at the end of each year's monitoring to capture lessons learned, and seek concurrence as to the best mix of monitoring techniques to employ in the next year's sampling based on scientific merit, applicability to the direct research questions posed in this Plan, and logistic and economic feasibility.

5.2.1.5 Stranding Response Plan for Major Navy Training Exercises in the TMAA

NMFS and the Navy will develop a draft Stranding Response Plan for Major Exercises in the TMAA. Pursuant to 50 CFR Section 216.105, the proposed plan outlined below will be included by reference and included in the TMAA proposed and final rules from NMFS, and included fully as part of (attached to) the Navy's MMPA LOA. This Stranding Response plan is specifically intended to outline the applicable requirements the authorization is conditioned upon in the event that a marine mammal stranding is reported in the TMAA during a major training exercise (MTE) (see glossary). As mentioned above, NMFS considers all plausible causes within the course of a stranding investigation. However, this plan in no way presumes that any strandings are related to, or caused by, Navy training activities, absent a

determination made in a Phase 2 Investigation as outlined in this plan, indicating that MFAS or explosive detonation in the TMAA were a cause of and/or contributed to the stranding. This plan is designed to address the following three issues:

- Mitigation – When marine mammals are in a situation that can be defined as a stranding (see glossary below), they are experiencing physiological stress. When animals are stranded, and alive, NMFS believes that exposing these compromised animals to additional known stressors would likely exacerbate the animal's distress and could potentially cause its death. Regardless of the factor(s) that may have initially contributed to the stranding, it is NMFS' goal to avoid exposing these animals to further stressors. Therefore, when live stranded cetaceans are in the water and engaged in what is classified as an Uncommon Stranding Event (USE) (see Appendix F), the shutdown component of this plan is intended to minimize the exposure of those animals to MFAS and explosive detonations, regardless of whether or not these activities may have initially played a role in the event.
- Monitoring – This plan will enhance the understanding of how MFAS (as well as other environmental conditions) may, or may not, be associated with marine mammal injury or strandings. Additionally, information gained from the investigations associated with this plan may be used in the adaptive management of mitigation or monitoring measures in subsequent LOAs, if appropriate. We note that detections of stranded marine mammals off the southern Alaskan Coast are typically accomplished using passive surveillance, i.e. individuals conducting their normal activities happen to see an animal and report it to the stranding network. If surveys or expanded active detection efforts are specifically used during Navy training exercises, we expect that the number of strandings detected during training may be higher relative to other times because of the increased targeted effort.
- Compliance – The information gathered pursuant to this protocol will inform NMFS' decisions regarding compliance with Sections 101(a) (5) (B and C) of the MMPA. In addition to outlining the necessary procedural steps for the Navy to undertake in the event of a USE during an MTE (as required by the LOA), this document describes NMFS' planned participation in stranding responses off the Alaskan Coast, as NMFS' response relates specifically to the Navy requirements described here. The NMFS Marine Mammal Health and Stranding Response Program (MMHSRP) and the participating Regional Stranding Networks have specific responsibilities regarding unusual marine mammal mortality events (UMEs) pursuant to Title IV of the MMPA. This standing plan does not serve to replace or preclude any of the procedures currently in place for NMFS' response to UMEs or to any normal operations of the stranding network. NMFS will pursue any activities to fulfill obligations relative to UMEs any time that a trigger is reached as determined by the Working Group on Marine Mammal Unusual Mortality Events. This document highlights (or adds to) applicable existing (and in development) protocols and procedures to be used with the specific circumstances and specific subset of strandings addressed here, namely a USE off the Alaskan Coast during the MTE. This document has been reviewed and approved by the NMFS staff responsible for conducting and overseeing the referenced activities and this plan will be implemented by NMFS to the degree that resources are available and logistics are feasible.

General Notification Provision

If, at any time or place (i.e., not just in TMAA and not just during the activities covered under NMFS' regulations), Navy personnel find a stranded marine mammal either on the shore, nearshore, or floating at sea, NMFS requests the Navy contact NMFS immediately (or as soon as clearance procedures allow) as described in the TMAA Stranding Communication Protocol (currently under development, but subject to incorporation into this plan upon mutual agency approval). NMFS will request the Navy provide NMFS with species or description of animal(s), the condition of the animal (including carcass condition if the

animal is dead, location, time of first discovery, observed behaviors (if alive), and photo or video (if available).

In addition, NMFS requests that in the event of a ship strike by any Navy vessel, at any time or place, the Navy do the following:

- Navy immediately report to NMFS the species identification (if known), location (lat/long) of the animal (or the strike if the animal has disappeared), and whether the animal is alive or dead (or unknown).
- As soon as feasible, report to NMFS the size and length of animal, an estimate of the injury status (e.g., dead, injured but alive, injured and moving, unknown, etc.), vessel class/type, and operational status.
- Report to NMFS the vessel length, speed, and heading as soon as feasible.
- Provide NMFS a photo or video, if possible.

Operational Response Plan

This section describes the specific actions the Navy must take in order to comply with NMFS' GOA TMAA LOA if a USE is reported to the Navy off the southern Alaskan Coast coincident to, or within 72 hours of, an MTE. This Stranding Response Plan will include an associated TMAA Stranding Communication Protocol (currently under development, but subject to incorporation into the Stranding Plan upon mutual agency approval), which will indicate, among other things, the specific individuals (NMFS Office of Protected Resources - HQ senior administrators) authorized to advise the Navy that certain actions are prescribed by the Stranding Response Plan.

1. Initial Stranding Response – The NMFS regional stranding network will respond to reports of stranded marine mammals in areas where there is geographic coverage by the stranding network, when feasible. All cetaceans that are responded to will receive examination appropriate to the condition code of the animal and the feasibility of the logistics. If a qualified individual determines that the stranding is a USE, NMFS staff (or other qualified individual) will initiate a Phase 1 Investigation. NMFS will immediately contact appropriate NMFS and Navy personnel (pursuant to the TMAA Stranding Communication Protocol). NMFS and Navy will maintain a dialogue, as needed, regarding the identification of the USE and the potential need to implement shutdown procedures.

2. Shutdown Procedures – Shutdown procedures are not related to the investigation of the cause of the stranding and their implementation is in no way intended to imply that MFAS is the cause of the stranding. Rather, as noted above, shutdown procedures are intended to protect cetaceans exhibiting indicators of distress and involved in a USE by minimizing their exposure to possible additional stressors (MFAS or explosive detonations), regardless of the factors that initially contributed to the USE. Only individuals specifically identified in the TMAA Stranding Communication Protocol (NMFS Protected Resources – HQ senior administrators) will be authorized to advise the Navy of the need to implement shutdown procedures (pursuant to the Stranding Response Plan/LOA).

a) If live or freshly dead cetaceans are involved in the USE, the Navy will implement the following procedures:

- If live cetaceans involved in the USE are in the water (i.e., could be exposed to sonar), NMFS will advise the Navy of the need to implement shutdown procedures defined in the glossary (pursuant to the Stranding Response Plan/LOA).
- NMFS will coordinate internally, with the Navy, and with other agencies and entities with the intent of obtaining aerial survey arrangements. If an aircraft is available, a survey will be

conducted within 14 miles (on the shore and in the water near the coast) of the stranding to look for additional animals that meet the USE criteria. NMFS will request that the Navy assist with aerial surveys, as resources are available.

- If no additional animals that meet the USE criteria are found (including if no aircraft were available to conduct a survey), and the originally detected animals are not in the water, and will not be put back in the water for rehabilitation or release purposes, or are dead, NMFS will advise the Navy that shutdown procedures need not be implemented at any additional locations.
- If additional cetacean(s) meeting the USE criteria are detected by surveys, the shutdown procedures will be followed for the newly detected animal(s) beginning at 2(a) above.
- If a qualified individual determines that it is appropriate to put live animals that were initially on the beach back in the water for rehabilitation or release purposes, NMFS will advise the Navy of the need to implement shutdown procedures pursuant to the Stranding Response Plan/LOA.

b) If the Navy finds an injured (or entangled) or dead cetacean floating at sea during an MTE, the Navy shall notify NMFS (pursuant to TMAA Stranding Communication Protocol) immediately or as soon as operational security considerations allow. The Navy should provide NMFS with the information outlined in the general notification provision above, as available. Based on the information provided, NMFS will determine if a modified shutdown (i.e., a shutdown other than those described here, based on specific information available at the time) is appropriate on a case-by-case basis.

c) In the event, following a USE, that: a) qualified individuals are attempting to herd animals back out to the open ocean and animals are not willing to leave, or b) animals are seen repeatedly heading for the open ocean but turning back to shore, NMFS and the Navy will coordinate (including an investigation of other potential anthropogenic stressors in the area) to determine if the proximity of MFAS operations or explosive detonations, though farther than 14 nm from the distressed animal(s), is likely decreasing the likelihood that the animals return to the open water. If so, NMFS and the Navy will further coordinate to determine what measures are necessary to further minimize that likelihood and implement those measures as appropriate. Navy and NMFS will maintain a dialogue regarding the plan to return the animal(s) to the water.

d) If no live (Condition Code 1) or freshly dead (Condition Code 2) cetaceans are involved in the USE, NMFS will advise the Navy that shutdown procedures need not be implemented. Aerial surveys will be conducted if feasible (see second bullet below).

3. Restart Procedures

- If at any time, the subject(s) of the USE die or are euthanized, NMFS will immediately advise the Navy that the shutdown around that animal(s)' location is no longer needed.
- Shutdown procedures will remain in effect until NMFS determines that, and advises the Navy that, all live animals involved in the USE have left the area (either of their own volition or herded). Leading up to restart, NMFS will coordinate internally, with the Navy, and with other federal and state agencies with the intent of securing arrangements to track the movement of the animals (via aircraft, vessel, tags, etc.) following the dispersal of the USE. If the Navy has restarted operations in the vicinity of the animals, NMFS and the Navy will further coordinate to determine (based on location and behavior of tracked animals and location/nature of Navy activities) if the proximity of MFAS operations is likely increasing the likelihood that the animals re-strand. If so, NMFS and the Navy will further coordinate to determine what measures are necessary to minimize that likelihood and implement those measures as appropriate.

4. Information – Within 72 hours of the notification of the USE the Navy will inform NMFS where and when they were operating MFAS or conducting explosive detonations (within 80 nm and 72 hours prior to the event). Within 7 days of the completion of any exercises that were being conducted within 80 nm or 72 hours prior to the event, the Navy will further provide available information to NMFS (per the GOA Stranding Communication Protocol) regarding the number and types of acoustic/explosive sources, direction and speed of units using MFAS, and marine mammal sightings information associated with those training activities. Information not initially available regarding the 80 nm, 72 hours, period prior to the event will be provided as soon as it becomes available. The Navy will provide NMFS investigative teams with additional relevant unclassified information as requested (or classified information to designated NMFS staff), if available.

5. Phase 1 Investigation – Because of the variability of available resources across stranding network agencies in the Alaska region, NMFS cannot currently commit, in advance, to the specific degree of investigation that will be conducted for any given stranding. NMFS stranding coordinators are currently assessing available resources with the goal of setting forth a plan that realistically outlines the possible responses in a given area. Meanwhile, the ideal responses (Phase 1 and 2 Investigations) are described in the Biomonitoring Protocols and are referred to below (here and in # 7), and NMFS will respond in the indicated manner when resources are available and it is logistically feasible:

Within 4 weeks of a USE (when feasible), NMFS will conduct and complete the Phase 1 Investigation (list of procedures typically included in Phase 1 investigation are included in the glossary of this document, description of actual procedures are contained in the Biomonitoring Protocols) for all USEs that occur along the southern Alaskan Coast coincident with MTEs. Results from the Phase 1 Investigation will be categorized in one of the two ways discussed below and trigger the indicated action:

- If the results of the Phase 1 Investigation indicate that the USE was likely caused by something (such as entanglement or ship strike) other than MFAS or explosive detonations authorized by the Navy's LOA, then the USE investigation will be considered complete as related to the MMPA authorization.
- If NMFS cannot conclude that the stranding was likely caused by something other than MFAS or explosive detonations authorized by the Navy LOA, rather, the results of the Phase 1 Investigation range from completely inconclusive to including potential early indicators that acoustic exposure could have played a role, then a Phase 2 Investigation will be conducted by qualified individuals, under the direction of NMFS staff, and an individual case report will be prepared for each animal (list of procedures typically included in Phase 2 investigation are included in the Glossary of this document, description of actual procedures are contained in the Biomonitoring Protocols).

6. Memorandum of Agreement (MOA) – The Navy and NMFS will develop an MOA, or other mechanism consistent with federal fiscal law requirements (and all other applicable laws), that allows the Navy to assist NMFS with the Phase 1 and 2 Investigations of USEs through the provision of in-kind services, such as (but not limited to) the use of plane/boat/truck for transport of stranding responders or animals, use of Navy property for necropsies or burial, or assistance with aerial surveys to discern the extent of a USE. The Navy may assist NMFS with the Investigations by providing one or more of the in-kind services outlined in the MOA, when available and logistically feasible and which do not negatively affect Fleet operational commitments.

7. Phase 2 Investigation – Please see # 5, Phase 1 Investigation. Results from the Phase 2 Investigation (procedures outlined in the Biomonitoring Protocols) will be categorized in one of the three ways discussed below and trigger the indicated action:

- If the results indicate that the USE was likely caused by something (such as entanglement or blunt force trauma) other than MFAS or explosive detonations authorized by the Navy's LOA, then the USE investigation will be considered complete as related to the MMPA authorization.
- If the results are inconclusive which, historically, is the most likely result (i.e., NMFS can neither conclude that the USE was likely caused by something other than acoustic trauma nor conclude that there is a high likelihood that exposure to MFAS or explosive detonations were a cause of the USE), then the USE investigation will be considered complete as related to the MMPA authorization.
- If the results of a comprehensive and detailed scientific investigation into all possible causes of the stranding event indicate that there is a high likelihood that MFAS was a cause of the USE, one of the following will occur: The Navy will be provided at least ten working days to review and provide comments on NMFS' summary and characterization of the factors involved in the USE. NMFS will consider the Navy's comments prior to finalizing any conclusions and/or deciding to take any action involving any take authorization.

8. USE Response Debrief and Evaluation – Within 2 months after a USE, NMFS and Navy staff will meet to discuss the implementation of the USE response and recommend modifications or clarifications to improve the Stranding Response Plan. These recommendations will feed into the adaptive management strategy discussed below.

9. Adaptive Management – The regulations under which the Navy's LOA (and this Stranding Response Plan) are issued will contain an adaptive management component. This gives NMFS the ability to consider the results of the previous years' monitoring, research, and/or the results of stranding investigations when prescribing mitigation or monitoring requirements in subsequent years. In the event that NMFS concludes that there is a high likelihood that MFAS or explosive detonations were a cause of a USE, NMFS will review the analysis of the environmental and operational circumstances surrounding the USE. In subsequent NMFS LOAs, based on this review and through the adaptive management component of the regulations, NMFS may require the mitigation measures or Stranding Response Plan be modified or supplemented if the new data suggest that modifications would either have a reasonable likelihood of reducing the chance of future USEs resulting from a similar confluence of events or would increase the effectiveness of the stranding investigations. Further based on this review and the adaptive management component of the regulations, NMFS may modify or add to the existing monitoring requirements if the data suggest that the addition of a particular measure would likely fill a specifically important data or management gap. Additionally, the USE Debrief and Evaluation discussed above (in combination with adaptive management) will allow NMFS and the Navy to further refine the Stranding Response Plan for maximum effectiveness.

Communication

Effective communication is critical to the successful implementation of this Stranding Response Plan. Very specific protocols for communication, including identification of the Navy personnel authorized to implement a shutdown and the NMFS personnel authorized to advise the Navy of the need to implement shutdown procedures (NMFS Protected Resources HQ – senior administrators) and the associated phone trees, etc. (to be included in the document entitled "TMAA Stranding Communication Protocols") will be finalized at a subsequent date, and updated yearly (or more frequently, as appropriate).

The Stranding Response Plan is dependent upon advance notice to NMFS (HQ and Alaska Regional Office) of the planned upcoming MTE. NMFS and the Navy will develop a mechanism (that conforms with operational security requirements) wherein the Navy can provide NMFS with necessary advance notification of MTEs.

NMFS will keep information about planned MTEs in a confidential manner and will transmit information to NMFS personnel responding to USEs to the minimum necessary to accomplish the NMFS mission under this plan.

Supplemental Documents in Development

GOA Stranding Communication Protocol

This document, which is currently in development, will include all of the communication protocols (phone trees, etc.) and associated contact information required for NMFS and the Navy to carry out the actions outlined in this Stranding Response Plan. This document is currently being developed by NMFS and when completed, will be updated yearly (or more frequently, as appropriate).

Biomonitoring Protocols for GOA

This NMFS document (which is currently in a draft form, but will be finalized in 2010) will contain protocols for the procedures that are necessary for NMFS staff to implement this Stranding Plan including:

- Qualifications necessary for individuals to implement certain parts of the Stranding Plan, such as: identifying a USE, identifying a Code 2 animal, or conducting a Phase 1 or 2 Investigation
- A protocol for the stranding responders that outlines the actions to take in the event of a USE during MTEs
- Protocols for the investigators that describe in detail the procedures implemented for conducting the Phase 1 and Phase 2 Investigations

Memorandum of Agreement

This document (or other mechanism consistent with federal fiscal law requirements and all other applicable laws), which will be finalized in 2010, will establish whereby the Navy can assist with stranding investigations, when feasible. This document will include a comprehensive list of the specific ways the Navy could provide this assistance.

5.2.1.6 Alternative Mitigation Measures Considered but Eliminated

As described in Section 3.9 and Appendix D, the vast majority of estimated sound exposures of marine mammals in the GOA during proposed active sonar activities would not cause injury. Potential acoustic effects on marine mammals would be reduced by the mitigation measures described previously. Therefore, through this EIS/OEIS and associated regulatory documents, NMFS and the Navy have concluded the Proposed Action and mitigation measures would achieve the least practical adverse impact on species or stocks of marine mammals.

In making a determination of "least practicable adverse impact" for MMPA analysis, NMFS considers the following factors relative to one another: (1) the manner in which, and the degree to which, the successful implementation of the measure is expected to minimize adverse impacts to marine mammals; (2) the proven or likely efficacy of the specific measure to minimize adverse impacts as planned; and (3) the practicability of the measure for Navy implementation, which includes consideration of personnel safety, practicality of implementation, and the impact on the effectiveness of the military readiness activity. Given these considerations, the following additional mitigation measures were analyzed and through the following explanation are eliminated from further consideration.

Seasonal and/or Geographic Limitations:

Benefit to Marine Mammals/Effectiveness of Measure

In previous documents NMFS has indicated that seasonal or geographic limitations are a direct and effective means of reducing adverse impacts to marine mammals. By reducing the overlap in time and space of the known concentrations of marine mammals and the acoustic footprint associated with the thresholds for the different types of take (either at all times and places where animals are concentrated, or times and places where they are concentrated for specifically important behaviors [such as reproduction or feeding]), the amount of take can be reduced.

However, the concept of geographical and seasonal (or temporal) limitations is inconsistent with the Title 10 responsibilities of Department of Defense to assure a fully trained and ready military force in regards to training activities in the GOA. Such restrictions would not be appropriate in the GOA. The training area locations utilized in the GOA were very carefully chosen by planners based on training requirements and the ability of ships, aircraft, and submarines to operate safely. Moving the training activities to alternative locations would impact the effectiveness of the training and has no known benefit.

It is important that any measures are used carefully at times and places where their effects are relatively well known. For example, if there is credible evidence that concentrations of marine mammals are known to be high at a specific place or during a specific time of the year, or that certain areas are selectively used for important life functions like breeding or feeding (such as the high densities of humpback whales in the main Hawaiian Islands, or North Atlantic right whale critical habitat on the east coast), then these types of seasonal or geographic exclusions or limitations can be effective. However, if marine mammals are only known to prefer certain types of areas (as opposed to specific areas) for certain functions (such as beaked whales use of seamounts or marine mammal use of productive areas like fronts), which means that they may or may not be present at any specific time, it may be less effective to require avoidance or limited use of that type of area all of the time.

Practicability of the Measure

Generally speaking, and specifically discussed in Chapter 2 of the EIS/OEIS, the Navy needs to have the flexibility to operate at any time or place to meet their training needs pursuant to Title 10. The Navy needs to be able to train in the largest variety of physical (bathymetry, etc.), environmental, and operational (within vicinity of different assets, such as airfields, instrumented ranges, homeports, etc.) parameters in order to be properly prepared. Additionally, Navy training, planning and implementation needs to be adaptable in order to accommodate the need of the Navy to respond to world events and the ever-changing strategic focus of the U.S. The Navy has always expressed a need to maintain the flexibility to train in an area if necessary for national security, and any measures imposed by NMFS need to account for this reality.

Aside from the general reasons of impracticability cited above, below are some of the specific reasons that certain specific types of seasonal and geographic restrictions or limitations are impracticable for the Navy.

Coastal restrictions (such as 25 nm from 200-m isobath) - Littoral waterspace is where potential enemies will operate. The littoral waterspace is also the most challenging area to operate due to a diverse acoustic environment. In real world situations, it is highly likely the Navy would be working in these types of areas. It is not realistic to refrain from training in the areas that are the most challenging and operationally important. Areas where ASW events are scheduled to occur are carefully chosen to provide for the safety of events and to allow for the realistic development of the training scenario including the ability of the exercise participants to develop, maintain, and demonstrate proficiency in all areas of warfare simultaneously. Limiting the training event to a few areas would have an adverse impact on the effectiveness of the training by limiting the ability to conduct other critical warfare areas including, but not limited to, the ability of the Strike Group to defend itself from threats on the surface and in the air while carrying out air strikes and/or amphibious assaults. In those locations where amphibious landing

events occur, coastal restrictions would decouple ASW training and Amphibious training, which are critically important to be conducted together due to the high risk to forces during actual Amphibious operations. Furthermore, training activities using integrated warfare components require large areas of the littorals and open ocean for realistic and safe training.

Sea Mounts and Canyons - Submarine tracking is a long and complicated tactical procedure. Seamounts are often used by submarines to hide or mask their presence, requiring the need to train in this complex ocean environment. This is precisely the type of area needed by the Navy to train. Sea mounts and canyons impact the way sound travels in water as well as the Navy's ability to search and track submarines. If the Navy does not train near sea mounts and canyons and understand how these features affect their ability to search and track a submarine, they will be unable to do so when faced with an actual threat. Exercise locations are carefully chosen based on training requirements and the ability of ships, aircraft, and submarines to operate safely. Given the strategic training needs, restricting active sonar operation around seamounts and canyons in the TMAA is not practicable. This discussion considers the impracticability of avoiding all seamounts and canyons. While it may be somewhat less impracticable to avoid a subset of specific seamounts or canyons, marine mammal use of these areas is ephemeral and varies based on many changing factors, which would make it difficult to justify requiring the avoidance of any particular features since doing so may or may not benefit marine mammals at any particular time.

Fronts and other Major Oceanographic Features – NMFS has determined that the impracticability to the Navy of avoiding these features outweighs the potential conservation gain. Though many species may congregate near fronts and other major oceanographic features, these areas may be both large and transitory, so restricting access to these features to avoid animals that may congregate in a small subset of the total areas is not practicable. Additionally, limiting sonar use in the vicinity of these types of features would disrupt training for the reasons described above for sea mounts and canyons.

Use of Dedicated or Independent Marine Mammal Observers (MMOs) to Implement Mitigation:

Benefit to Marine Mammals/Effectiveness of Measure

Navy lookouts are specifically trained to detect anything (living or inanimate) that is in the vicinity of, visible from, or approaching the vessel. The safety of the personnel on board and of the vessel depends on their performance. While they receive training that is intended to expose them to the different species of marine mammals they might see and the behaviors they might potentially observe, they would certainly not be expected to differentiate between species or identify the significance of a behavior as effectively as an independent MMO. However, identification to species and understanding of marine mammal behavior is not necessary for mitigation implementation – for that, a lookout must simply detect a marine mammal and estimate its distance (e.g., within 1000 yds, 500 yds, or 200 yds) to the vessel. Though dedicated and independent MMOs are critical to implement a Monitoring Plan, Navy lookouts performing their normal duties are expected to be effective at detecting marine mammals for mitigation implementation.

Practicability of the Measure

Following are several reasons for why using third-party observers from air or surface platforms, in addition to or instead of the existing Navy-trained lookouts is not practicable.

- The use of third-party observers could compromise security due to the requirement to provide advance notification of specific times/locations of Navy platforms.
- Reliance on the availability of third-party personnel would also impact training flexibility, thus adversely affecting training effectiveness. The presence of other aircraft in the vicinity of naval exercises would raise safety concerns for both the commercial observers and naval aircraft.
- Use of Navy observers is the most effective means to ensure quick and effective implementation of mitigation measures if marine species are spotted. A critical skill set of effective Navy training

is communication. Navy lookouts are trained to act swiftly and decisively to ensure that appropriate actions are taken.

- Security clearance issues would have to be overcome to allow non-Navy observers onboard exercise platforms.
- Some training events will span one or more 24-hour period(s), with operations underway continuously in that timeframe. It is not feasible to maintain non-Navy surveillance of these operations, given the number of non-Navy observers that would be required onboard.
- Surface ships with active mid-frequency sonar have limited berthing capacity. Exercise planning includes careful consideration of this limited capacity in the placement of exercise controllers, data collection personnel, and Afloat Training Group personnel on ships involved in the exercise. Inclusion of non-Navy observers onboard these ships would require that in some cases there would be no additional berthing space for essential Navy personnel required to fully evaluate and efficiently use the training opportunity to accomplish the exercise objectives.
- Aerial surveying during an event raises safety issues with multiple, slow civilian aircraft operating in the same airspace as military aircraft engaged in combat training activities. In addition, most of the training events take place far from land, limiting both the time available for civilian aircraft to be in the exercise area and presenting a concern should aircraft mechanical problems arise.
- Scheduling civilian vessels or aircraft to coincide with training events would impact training effectiveness, since exercise event timetables cannot be precisely fixed and are instead based on the free-flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the progress of the exercise and impact the effectiveness of the military readiness activity.
- Multiple events may occur simultaneously in areas at opposite ends of the TMAA and continue for multiple days at a time. There are not enough qualified third-party personnel to accomplish the monitoring task.

Use of Additional Detection Methods to Implement Mitigation (Shutdown Zones):

Benefit to Marine Mammals/Effectiveness of Measure

Lookouts stationed on surface vessels are currently the primary component of the Navy's marine mammal detection capabilities, with some opportunistic assistance from aerial or passive acoustic platforms when such assets are participating in a given exercise. The use of additional detection methods, such as those listed in Section 5.2.1.2, for the implementation of mitigation might further minimize the Level A and Level B of marine mammals. Specifically, passive and active acoustic methods may detect animals that were below the surface (for passive acoustic detection, the animals would have to be vocalizing to be detected, but for active acoustic detection they would not – the HFM3 system utilized by LFA sonar vessels effectively detects marine mammals to within 1 km of the sonar source).

In order for additional marine mammal detection methods to assist in the implementation of mitigation (shutdown and powerdown), they must be able to localize, or identify where the marine mammal is in relation to the sound source of concern (since shutdown and powerdown mitigation is triggered by the distance from the sound source), and transmit the applicable data to the commanding officer in real time (i.e., quickly so that the sonar source can be turned down or shut off right away or the explosive detonation can be delayed). A limited number of techniques based on the real-time participation of additional observers (such as additional aerial platforms) can achieve this, while many passive acoustic methods cannot. The section below contains information that speaks both to the practicality of implementation of some methods as well as the effectiveness.

Practicability of the Measure

Radars - While Navy radars are used to detect objects at or near the water surface, radars are not specifically designed to search for and identify marine mammals. For example, when an object is detected by radar, the operators cannot definitively discern that it is a whale. During a demonstration project at Pacific Missile Range Facility (PMRF) in Hawaii, radar systems were only capable of detecting whales under very controlled circumstances and when these whales were already visually spotted by lookouts/watchstanders. Enhancing radar systems to detect marine mammals requires additional resources to schedule, plan and execute Navy limited objective experiments (LOEs) and RDT&E events. The Navy is currently reviewing opportunities to pursue enhancing radar systems and other developmental methods such as laser detection and ranging technology as potential mitigation for detecting marine mammals. Until funding resources and the data are available to develop enhanced systems, it is not known whether it will be technically feasible in the future to implement radar as an additional detection method.

Additional Platforms (aerial, UAV, Gliders, and Other) - The number of aerial and unmanned aerial vehicle (UAV) systems currently integrated into fleet training is extremely low and their availability for use in most training events is rare; therefore, shifting their use and focus from hunting submarines to locating marine mammals would be costly and negatively impact the training objectives related to these systems. If additional platforms are civilian, scheduling civilian vessels or aircraft to coincide with training events would affect training effectiveness since exercise events or timetables are not fixed and are based on a free flow development of tactical situations. Waiting for civilian aircraft or vessels to complete surveys, refuel, or be on station would slow the required progress of the training exercise. In addition, the precise location data and exercise plans provided to non-Navy assets poses logistical challenges and classification or security issues. While the Navy is currently reviewing options for additional detection methods, these additional platforms proved to be impracticable for the following reasons:

- Additional Aerial Survey Detection: Airborne assets when available already monitor for the presence of marine mammals with no reported incidents where marine mammals were overlooked during an exercise or where aerial assets were unable to perform their duties while watching for marine mammals; therefore, the allocation of additional airborne assets is not well justified. In addition, the presence of additional aircraft (not involved in the exercise) near naval exercises would present safety concerns for both commercial and naval observers because ASW training exercises are dynamic, can last several hours or days, and cover large areas of ocean several miles from land.
- UAV Detection: Currently and in the foreseeable five-year period of the requested authorization, these assets are extremely limited and are rarely if ever available and, therefore, impractical and expensive.
- Gliders Detection: Gliders are not currently capable of providing real time data and, therefore, are not an effective detection method for use in mitigation implementation.

Active Sonar - As previously noted, the Navy is actively engaged in acoustic monitoring research involving a variety of methodologies; however, none of the methodologies have been developed to the point where they could be used as a mitigation tool for MFAS or HFAS. At this time, the active sonar and adjunct systems listed below proved to be impracticable for the following reasons:

- Use of multiple systems (meaning the MFAS used for the exercise plus any additional active system used for marine mammal detection) operating simultaneously increases the likelihood that a submarine may be detected under conditions where it is attempting to mask its presence before activating sonar, resulting in an impact to the effectiveness of the military readiness activity. Additionally, interference may occur when certain active sonar systems (such as HFM3) are activated concurrently with MFAS.

- HFM3 is an adjunct system used by LFA because the hulls of those platforms can be modified and travel can occur at slow speeds. MFAS combatants are not equipped with HFM3 systems and it is impractical to install such a system on MFAS combatants.

The Navy will continue to coordinate acoustic monitoring and detection research specific to the proposed use of active sonar. As technology and methodologies become available, their applicability and viability will be evaluated for potential future incorporation.

Additional Passive Acoustic Monitoring - To provide a specialized localization capability (distance, direction, etc.), most of the systems (Sonobuoys, SQQ89, Bottom-Mounted Sensors) would require significant modifications. The Navy is working to develop or enhance systems with distance measuring capabilities. Until these capabilities are available, exercise participants can use these systems to aid in marine mammal detection, but not solely to implement mitigation measures. Although passive contact on marine mammals only indicates the presence, not the range (distance and direction), the information on any passive acoustic detections is disseminated real time to allow lookouts to focus their visual search for marine mammals.

The Navy is improving the capabilities to use range instrumentation to aid in the passive acoustic detection of marine mammals. At the Southern California Offshore ASW Range (SOAR) in the SOCAL Range Complex, development of effective passive acoustic detection as part of the instrumented range is progressing fairly rapidly. Passive acoustic monitoring has the potential to significantly improve the ability to detect marine mammal presence within SOAR. The Navy sponsored Marine Mammal Monitoring on Navy Ranges (M3R) program has developed hardware and software that leverages the SOAR sensors to detect and localize marine mammal vocalizations. Localization is possible when the same signal is detected, precisely time-tagged, and associated on at least three sensors. Prototype M3R systems have been installed on both the AUTEC (Bahamas) and SOAR ranges.

The M3R system is capable of monitoring all the range hydrophones in real-time. The Navy is refining the M3R system by developing tools to display detected transient signals including marine mammal vocalizations and localizations. The tools operate in real-time and are being used in a series of tests to document marine mammal species, their vocalizations, and their distribution on the SOAR range. In addition, they are being used to collect and analyze opportunistic data at AUTEC, and as part of the on-going Behavioral Response Study (BRS) there.

Reliable automated methods are needed for detection and classification of marine mammal calls to allow range hydrophones to be used for routine marine mammal monitoring in SOAR. The performance of these hydrophones must be quantified. The calls of many baleen whale species are stereotyped and well known. Identification of stereotyped mysticete calls within SOAR has been accomplished using automatic detectors. However, the full range of mysticete call types that are expected within SOAR is not known (e.g. sei whales). Odontocete call identification is more difficult owing to their call complexity. Calls of some odontocetes, such as sperm whales, killer whales, and porpoises, are easily distinguishable. For most species, however, the variation in and among call types is a topic of current research. Likewise, pinniped call types are complex and more data are needed to develop automatic detectors and classifiers to allow automated identification for pinniped species within SOAR. The Navy continues to develop this technology.

At SOAR the large number of species and high animal density combined with imprecise acoustic localization makes the efficacy of such monitoring for use for mitigation implementation during real-time operations questionable.

Prior to implementation of real-time passive acoustic monitoring for use in mitigation, the species present and their distribution should be established. A system must be implemented on range and Detection, Classification, and Localization (DCL) algorithms specific to these species must be developed and tests with visual observers must be conducted to verify their performance. The Navy continues to work on this, and such systems are not yet available for consideration as required mitigation.

Infrared technology – As a complement to existing methods, use of the Infrared (IR) band for marine mammal detection and location has some obvious benefits if proved viable, including the ability to operate infrared at night, as well as the ability to establish automated detections procedures which might well reduce the factor of human fatigue that affects observer-based methods. The Navy has committed to a program of research, development, and testing of IR-based technologies for detection of marine mammals in the wild.

The Navy program will have two main thrusts. NAVAIR will continue to pursue operational tests of their airborne monitoring and mitigation program for marine species using net-centric Intelligence, Surveillance, and Reconnaissance (ISR) systems. The proposed system uses a radar detect and track cueing sensor for a turreted airborne Electro-Optic/Infrared/Multi-spectral imaging sensor. If fully funded for prototyping and demonstration, this program would evaluate the efficacy for marine mammal detection of a large, high-powered system designed, tested, and deployed for other purposes, and operates beyond the domain of research Science and Technology.

At the same time, the Office of Naval Research (ONR) will take the lead in pursuing a longer-range, research S&T program to evaluate new concepts for IR detection that may ultimately lead to an operationally viable technique(s). The focus of the ONR effort will be on comparatively small, low-power systems that might be deployable on small, robot aircraft known as Unmanned Aerial Vehicles (UAVs) as well as operating in a ship-based mode. Either option might allow the inclusion of standard video for confirmation of mammal detections during the day. The UAV option might allow for multiple passages of an area of interest at low altitude to confirm mammal detections and identification.

ONR will continue to support this effort for at least several years, with the potential for sustained support, though the future breadth of this program will depend on the outcome of early efforts. The system is not considered practicable to require for implementation at this time.

Avoidance of Federal and State Marine Protected Areas:

Benefit to Marine Mammals/Effectiveness of Measure

Pursuant to the MMPA, NMFS makes decisions regarding required mitigation based on biological information pertaining to the potential impacts of an activity on marine mammals and their habitat (and the practicability of the measure), not management designations intended for the broad protection of various other marine resources.

As mentioned previously, no known areas of specific importance to marine mammals (that would benefit from a training restriction, i.e., not counting pinniped haulouts where the animals are not in the water the majority of the time) are present within these designated areas. Therefore, limiting activity in these areas would be of questionable value to marine mammals.

Practicability of the Measure

As discussed above, these measures would not offer any additional benefit to marine mammals. Additionally, the impracticability of seasonal and geographic restrictions and limitations, which applies to this measure, is discussed above.

Suspension of MFAS Training at Night, or During Low Visibility or Surface Duct:

Benefit to Marine Mammals/Effectiveness of Measure

The Navy is capable of ***effectively monitoring*** a 1000-yd safety zone using night vision goggles and passive acoustic monitoring (infrared cameras are sometimes used as an extra tool for detection, when available, but have not been shown to show a significant enhancement of current capabilities). Night vision goggles are always available to all vessel and aircrews as needed and passive acoustic monitoring is always in use. As mentioned previously, the estimated zone in which TTS may be incurred is within about 140 m of the sound source (830 m for harbor seals), and the estimated zone for injury is within 10 m of the sonar dome. The powerdown and shutdown zones are at 1000, 500, and 200 yds. The Navy is expected to be able to effectively implement the necessary mitigation measures during nighttime and times of lower visibility.

Because of the limited visibility beyond 1000 yards, Navy personnel could potentially detect fewer animals early (outside of the 1000 yds), as they are approaching to within 1000 yd, which could result in a slightly delayed powerdown or shutdown as compared to when operations are conducted in full daylight. However, any such potential delays would be at the outer edge of the safety zone and would not result in an animal being exposed to received sound levels associated with TTS or injury. So, suspension of MFAS during times of lower visibility may slightly reduce the exposures of marine mammals to levels associated with behavioral harassment, but would not reduce the number of marine mammals exposed to sound levels associated with TTS or injury.

Regarding surface ducts, their presence is based on water conditions in the exercise areas, is not uniform, and can change over a period of a few hours as the effects of environmental conditions such as wind, sunlight, cloud cover, and tide changes alter surface duct conditions. Across a typical exercise area, the determination of "significant surface ducting" is continually changing, and this mitigation measures cannot be accurately implemented. Furthermore, surface ducting alone does not necessarily increase the risk of MFA sonar impacts to marine mammals. While surface ducting causes sound to travel farther before losing intensity, simple spherical and cylindrical spreading losses result in a received level of no more than 175 dB rms at approximately 1,100 yards (assuming the nominal source of 235 dB rms), even in significant surface ducting conditions.

Practicability of the Measure

ASW training using MFAS is required year round in all environments, to include nighttime and low visibility conditions or conditions that realistically portray bathymetric features where adversary submarine threats (i.e., extremely quite diesel electric or nuclear powered) can hide and present significant detection challenges. Unlike an aerial dogfight, which is over in minutes or even seconds, ASW is a cat and mouse game that requires large teams of personnel working in shifts around the clock (24-hours) typically over multiple days to complete an ASW scenario. ASW can take a significant amount of time to develop the tactical picture (i.e., understanding of the battle space such as area searched or unsearched, identifying false contacts, and water conditions). Reducing or securing power at night or in low visibility conditions would affect a Commander's ability to develop the tactical picture as well as not provide the needed training realism. If there is an artificial break in the exercise by reducing power or suspending MFAS use, the flow of the exercise is lost and several hours of training will have been wasted. Both lost time and training differently than what would be needed in combat diminish training effectiveness.

MFAS training at night is vital because differences between daytime and nighttime affect the detection capabilities of MFAS systems. Ambient noise levels are higher at night because many species use the nighttime period for foraging and movement. Temperature layers, which affect sound propagation, move up and down in the water column from day to night. Consequently, personnel must train during all hours

of the day to ensure they identify and respond to changing environmental conditions. An ASW team trained solely during the day cannot be sent on deployment and be expected to fight at night because they would not identify and respond to the changing conditions.

Finally, as a matter of safety and international law, Navy vessels are required to use all means available in restricted visibility, including MFAS and positioning of additional lookouts, to provide heightened vigilance to avoid collision. The *International Navigation Rules of the Road* considers periods of fog, mist, falling snow, heavy rainstorm, sandstorms, or any similar events as "restricted visibility." In restricted visibility, all mariners, including Navy vessel crews, are required to maintain proper lookout by sight and hearing as well as "by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision." Prohibiting or limiting vessels from using sensors like MFAS during periods of restricted visibility violates international navigational rules, increases navigational risk, and jeopardizes the safety of the vessel and crew.

Surface ducting occurs when water conditions (e.g., temperature layers, lack of wave action) result in sound energy emitted at or near the surface to be refracted back up to the surface, then reflected from the surface only to be refracted back up to the surface so that relatively little sound energy penetrates to the depths that otherwise would be expected. This increases active detection ranges in a narrow layer near the surface, but decreases active sonar detection below the thermocline, a phenomenon that submarines have long exploited. Significant surface ducts are conditions under which ASW training must occur to ensure Sailors learn to identify these conditions, how they alter the abilities of MFA sonar systems, and how to deal with the resulting effects on MFA sonar capabilities. To be effective, the complexity of ASW requires the most realistic training possible. Reducing power in significant surface ducting conditions undermines training realism, and is, therefore, impracticable.

Delayed Restart of MFAS after Shutdown or Powerdown:

Benefit to Marine Mammals/Effectiveness of Measure

NMFS' assessment indicates that expanding the delay (until sonar can be restarted after a shutdown due to a marine mammal sighting) for deep-diving species adds minimal protective value for the following reasons:

- The ability of an animal to dive longer than the required shutdown time does not mean that it will always do so. Therefore, the additional delay would only potentially add value in instances when animals had remained under water for longer than the shutdown time required.
- Navy vessels typically move at 10-12 knots (5-6 m/sec) when operating active sonar and potentially much faster when not. Fish and Lauder (2006) measured speeds of 7 species of odontocetes and found that they ranged from 1.4–7.30 m/sec. Even if a vessel was moving at the slower typical speed associated with active sonar use, an animal would need to be swimming near sustained maximum speed for an hour in the direction of the vessel's course to stay within the safety zone of the vessel (i.e., to be in danger of being exposed to levels of sonar associated with injury or TTS).
- Additionally, the times when marine mammals are deep-diving (i.e., the times when they are under the water for longer periods of time) are the same times that a large portion of their motion is in the vertical direction, which means that they are far less likely to keep pace with a horizontally moving vessel.
- Given that, the animal would need to have stayed in the immediate vicinity of the sound source for an hour and considering the maximum area that both the vessel and the animal could cover in an hour, it is improbable that this would randomly occur. Moreover, considering that many animals have been shown to avoid both acoustic sources and ships without acoustic sources, it is improbable that a deep-diving cetacean (as opposed to a dolphin that might bow ride) would

choose to remain in the immediate vicinity of the source. It is unlikely that a single cetacean would remain in the safety zone of a Navy sound source for more than 30 minutes.

- Last, in many cases, the lookouts are not able to differentiate species to the degree that would be necessary to implement this measure. Plus, Navy operators have indicated that increasing the number of mitigation decisions that need to be made based on biological information is more difficult for the lookouts (because it is not their area of expertise).

Practicability of the Measure

When there is an artificial break in the exercise (such as a shutdown) the flow of the exercise is lost and several hours of training may be wasted, depending on where the Navy was in the exercise. An increase in the delay of MFAS use that occurs during an exercise will likely further negatively affect the effectiveness of the military readiness training because it will be harder to regain the flow of the exercise the longer the equipment and personnel are on hold. Moreover, lengthening a delay in training necessitates a continuation of the expenditure of resources (operation of all of the equipment and personnel), while not making progress towards the accomplishment of the mission (training completion).

Halting of MFAS Use in the Event of a Marine Mammal Injury or Death (and Stranding) until Cause is Determined:

Benefit to Marine Mammals/Effectiveness of Measure

Only in a very small portion of incidents (such as when a ship strikes a whale and personnel realize it immediately) is the cause of marine mammal injury or death immediately known. Halting MFAS use in the event of a marine mammal stranding may have only a very limited immediate benefit to marine mammals if animals have stranded and are still in the water and are within a certain distance of a Navy sound source(s) (not to imply that the Navy source would be assumed to have caused the event), i.e., it is physically possible for them to be exposed to received levels of sound that could potentially result in an additional adverse effects. In this case, cessation of sonar may alleviate additional stress to an animal that is already in a compromised physical state. However, if stranded animals are dead or on the beach, the benefit of a cessation of sonar does not exist as neither dead nor beached animals can benefit from it. The Navy only plans to conduct approximately 678 hours of hull-mounted MFAS activity annually in the TMAA. The Navy will be required (by the MMPA authorization) to notify NMFS immediately if an injured, stranded, or dead marine mammal is found during or shortly after, and in the vicinity of, any Navy training exercise utilizing MFAS, HFAS, or at-sea explosions taking place within the TMAA.

Practicability of the Measure

Investigations into the causes of stranding events often take months or years and the most probable outcome is that a definitive determination of cause is not made. Despite the fact that the Navy has been conducting thousands of hours of sonar, each, in southern California, the Pacific Northwest, around Hawaii, and off the east coast of the U.S. for multiple years, NMFS and the Navy have concluded that only 5 strandings worldwide (and not in the areas mentioned) can be associated with MFAS use. It is impracticable to halt the use of MFAS while the cause of a stranding is determined.

Ramp Up of Sonar Source Prior to Full Power Operation:

Benefit to Marine Mammals/Effectiveness of Measure

Based on the evidence that some marine mammals avoid sound sources, such as vessels, seismic sources, or MFAS (Richardson et al. 1995, Southall et al. 2007, and DoN 2008), the theory behind the ramp-up is that animals would move away from a sound source that was ramped up starting at low energy, which would result in the animals not being suddenly exposed to a more alarming, or potentially injurious sound. Compton et al. (2008) noted that this response has not been empirically demonstrated, that the effectiveness of the measure would likely vary between species and circumstances, and that the

effectiveness of the measure should be the focus of further research (i.e., controlled exposure experiments). The implicit assumption is that animals would have an avoidance response to the low power sonar and would move away from the sound and exercise area; however, there is no data to indicate this assumption is correct. The Navy is currently gathering data and assessing it regarding the potential usefulness of this procedure as a mitigation measure. With seismic surveys, which have relatively large safety zones compared to MFAS (and for which NMFS estimates that injury can occur at greater distances from the source than MFAS), NMFS utilizes ramp-up as a cautious mitigation measure to reduce Level B harassment and help ensure that Level A harassment does not occur.

Practicability of the Measure

Ramp-up procedures are not a viable alternative for MFA sonar training events as the ramp-up would alert opponents to the participants' presence, thus undermining training realism and effectiveness of the military readiness activity. When a MFA sonar ship turns its sonar on, area submarines are alerted to its presence. A submarine can hear an active sonar transmission farther away than the surface ship can hear the echo of its sonar off the submarine. Ideally, the surface ship will detect the submarine in time to attack the submarine before the submarine can attack one of the ships of the Strike Group (noting, of course, that attacks during training events are not actual attacks). If the MFA sonar ship starts out at a low power and gradually ramps up, it will give time for the submarine to take evasive action, hide, or close in for an attack before the MFA sonar is at a high enough power level to detect the submarine. Additionally, using these procedures would not allow the Navy to conduct realistic training, or "train as they fight," thus adversely impacting the effectiveness of the military readiness activity. Ramp up would constitute additional unnecessary sound introduced into the marine environment, in and of itself constituting harassment and this measure does not account for the movement of the ASW participants over the period of time when ramp up would be implemented.

Enlargement or Modification of Powerdown/Shutdown Zones of Hull-mounted Sonar:

Benefit to Marine Mammals/Effectiveness of Measure

The current power down and shut down zones are based on scientific investigations specific to MFA sonar for a representative group of marine mammals. They are based on the source level, frequency, and sound propagation characteristics of MFA sonar. The zones are designed to preclude direct physiological effect from exposure to MFA sonar. Specifically, the current power-downs at 500 yards and 1,000 yards, as well as the 200 yard shut-down, were developed to minimize exposing marine mammals to sound levels that could cause TTS and PTS. The underlying received levels of sound that were used to determine the appropriate safety zone distances are based on: for TTS - empirical information gathered on the levels at which the onset of noise-induced loss in the hearing sensitivity of captive cetaceans occurs, and, for PTS – extrapolations from the cetacean TTS data that incorporate TTS growth data from terrestrial animals. NMFS has determined that these measures effectively accomplish this.

Enlargement of the powerdown or shutdown zones would primarily result in the further reduction of the maximum received level that the detected animal might be exposed to, which could potentially mean that an animal expected to respond in a manner NMFS would classify as level B harassment could potentially either respond in a less severe manner or maybe not respond at all. This could be more important at an important time or place or in the presence of species or age-classes of concern (such as beaked whales). NMFS has received varying recommendations regarding the potential size of an expanded powerdown or shutdown zone, including 2 km, 4 km, or the 154 dB isopleth. As noted below, the ability of the lookouts to effectively monitor the safety zone decreases as the distance to the edge of the zone increases and the area that it is necessary to monitor increases by a factor of 4 as the distance to the edge doubles.

A review of the Navy's post-exercise reports shows lookouts have not reported any observed response of marine mammals at any distance.

Practicability of the Measure

The outer safety zone the Navy has developed (1000 yd) is also based on a lookout's ability to realistically maintain situational awareness over a large area of the ocean, including the ability to detect marine mammals at that distance during most conditions at sea. Requirements to implement procedures when marine mammals are present well beyond 1,000 yards dictate that lookouts sight marine mammals at distances that, in reality, are not always possible. These increased distances also significantly expand the area that must be monitored to implement these procedures. For instance, if a power down zone increases from 1,000 to 4,000 yards, the area that must be monitored increases sixteen-fold. Increases in safety zones are not based in science, provide limited benefit to marine mammals and severely impact realistic ASW training by increasing the number of times that a ship would have to shut down active sonar, impacting realistic training, and depriving ships of valuable submarine contact time. Commanders participating in training designed for locating, tracking, and attacking a hostile submarine could lose awareness of the tactical situation through increased stopping and starting of MFA sonar leading to significant exercise event disruption. Increased shutdowns could allow a submarine to take advantage of the lapses of active sonar, and position itself for a simulated attack, artificially changing the reality of the training activity. Given the operational training needs, increasing the size of the safety range is generally impracticable.

Expansion of Exclusion Area Delineated for Use with Explosive Detonations:

Benefit to Marine Mammals/Effectiveness of Measure

As described previously, the current designated exclusion zones for three exercise types (SINKEX, BOMBEX, and MISSILEX) are not large enough to prevent TTS should one of the largest explosives (MK-82 or Harpoon) detonate while the animal is at some distance outside of the exclusion zone. If the exclusion zone were enlarged, the Navy could theoretically reduce the number of TTS takes that might occur – however, anticipated takes by TTS are already very low, and the exclusion zones are more than large enough to avoid injury from all charges.

Practicability of the Measure

As mentioned above, SINKEXs have associated range clearance procedures that cover a circle with a radius of either 2 nm (though the exclusion zone is only 1 nm), 1,645 m, or 914 m. Enlarging these circles to encompass the TTS isopleths for these exercise means doubling the radius of the exclusion zones (or more), which would mean that an area 4 times the size would need to be monitored. Generally speaking, the Navy could do this in one of two ways: they could either use the same amount of resources to monitor the area that is 4 times larger, which could potentially result in less focus on the center area that is more critical (because more severe effects are expected closer to the source where the received level would be louder), or they could maintain the same level of coverage by increasing the resources used for monitoring by four times (or more), which is not practicable considering the limited anticipated protective value of the measure.

Monitoring of Explosive Exclusion Area During Exercises:

Benefit to Marine Mammals/Effectiveness of Measure

The Navy's SINKEX and BOMBEX measures currently require that the Navy survey a safety zone prior to an exercise, and then during the exercise when feasible. Additionally, passive acoustic means are used to detect marine mammals during the exercise. Continuous monitoring during an explosive exercise could potentially decrease the number of animals exposed to energy or pressure levels associated with take. However, one could assume that animals would continue to avoid the area to some degree if continuous explosions were occurring in the areas.

Of note, aside from SINKEXs, training events involving explosives are generally completed in a short amount of time. For smaller detonations such as those involving underwater demolitions training, the area is observed to ensure all the charges detonated and that they did so in the manner intended; however, it is not possible to have visual contact 100 percent of the time for all explosive in-water events. The Navy must clear all people from the explosive zone of influence prior to an in-water explosive event for the safety of personnel and assets. If there is an extended break between clearance procedures and the timing of the explosive event, clearance procedures are repeated.

Practicability of the Measure

There are potentially serious safety concerns associated with monitoring an area where explosions will occur and the Navy must take those into consideration when determining when monitoring during an exercise is feasible. While the Navy's measures allow for some monitoring during explosive exercises, it is not practicable to do all of the time.

Using MFA and HFA Sonar with Output Levels as Low as Possible Consistent with Mission Requirements or Using Active Sonar Only When Necessary:

Operators of sonar equipment are trained to be aware of the environmental variables affecting sound propagation. In this regard, the sonar equipment power levels are always set consistent with mission requirements. Active sonar is only used when required by the mission since it has the potential to alert opposing forces to the sonar platform's presence. The Navy remains committed to using passive sonar and all other available sensors in concert with active sonar to the maximum extent practicable consistent with mission requirements.

Scaling Down Training to Meet Core Aims:

As with each Navy range complex, the primary mission of the ATA is to provide a realistic training environment for naval forces to ensure that they have the capabilities and high state of readiness required to accomplish assigned missions. Modern war and security operations are complex. Modern weaponry has brought both unprecedented opportunity and innumerable challenges to the Navy. Smart weapons, used properly, are very accurate and actually allow the military Services to accomplish their missions with greater precision and far less destruction than in past conflicts. But these modern smart weapons are very complex to use. U.S. military personnel must train regularly with them to understand their capabilities, limitations, and operation. Modern military actions require teamwork between hundreds or thousands of people, and their various equipment, vehicles, ships, and aircraft, all working individually and as a coordinated unit to achieve success. These teams must be prepared to conduct activities in multiple warfare areas simultaneously in an integrated and effective manner. Navy training addresses all aspects of the team, from the individual to joint and coalition teamwork. Training events are identified and planned because they are necessary to develop and maintain critical skills and proficiency in many warfare areas. Exercise planners and Commanding Officers are obligated to ensure they maximize the use of time, personnel and equipment during training. The level of training expressed in the Proposed Action and alternatives is essential to achieving the primary mission of the ATA.

Limiting the Active Sonar Event Locations:

Areas where events are scheduled to occur are carefully chosen to provide for the safety of events and to allow for the realistic development of the training scenario including the ability of the exercise participants to develop, maintain, and demonstrate proficiency in all areas of warfare simultaneously. Limiting the training event to a few areas would have an adverse impact to the effectiveness of the training by limiting the ability to conduct other critical warfare areas including, but not limited to, the ability of Navy ships to defend themselves from threats on the surface and in the air while carrying out other activities. Limiting the exercise areas would concentrate all active sonar use, resulting in unnecessarily prolonged and intensive sound levels rather than the more transient exposures predicted by

the current planning that makes use of multiple exercise areas. Furthermore, exercises using integrated warfare components require large areas of the littorals and open ocean for realistic and safe training.

Implementing Vessel Speed Reduction:

Vessels engaged in training use extreme caution and operate at a slow, safe speed consistent with mission and safety. Ships and submarines need to be able to react to changing tactical situations in training as they would in actual combat. Placing arbitrary speed restrictions would not allow them to properly react to these situations. Training differently than that which would be needed in an actual combat scenario would decrease training effectiveness and reduce the crew's abilities.

The majority of the ships participating in training activities in the TMAA have a number of advantages for avoiding ship strikes as compared to most commercial merchant vessels. These include the following: (1) Navy ships have their bridges positioned forward, offering good visibility ahead of the bow; (2) Crew size is much larger than that of merchant ships, allowing for more potential observers on the bridge; (3) Dedicated lookouts are posted during a training activity scanning the ocean for anything detectable in the water; anything detected is reported to the Officer of the Deck; (4) Navy lookouts receive extensive training including Marine Species Awareness Training designed to provide marine species detection cues and information necessary to detect marine mammals; and (5) Navy ships are generally much more maneuverable than commercial merchant ships.

Restricting the Use of MFA Sonar During ASW Training Events While Conducting Transits Between Islands (i.e., Choke-points):

This restriction is not applicable to training in the TMAA. A chokepoint is a strategic strait or canal. Although there are over 200 major straits around the world, only a handful are considered to be strategic "chokepoints," such as the Strait of Gibraltar, Panama Canal, Strait of Magellan, Strait of Malacca, Bosporus and Dardanelles, Strait of Hormuz, Suez Canal, and Bab el Mandeb. While chokepoints are relatively few in number, significant quantities of international commerce and naval shipping move through these chokepoints, making them strategically important to the United States because a single quiet diesel submarine can position itself in the chokepoint and effectively block access beyond that point. The primary similarity of these chokepoints is lengthy shorelines that restrict maneuverability. The longer and more narrow the passage, the more likely the chokepoint creates an area of restricted egress for marine mammals. However these features are not present in the areas of the TMAA in which the Navy plans to conduct sonar training.

Adopting Mitigation Measures of Foreign Nation Navies:

The Navy typically operates in a Strike Group configuration where the group focuses its efforts on conducting air strikes and/or amphibious operations ashore. This requires that the Navy train to what it calls "integrated warfare" meaning that Strike Groups must conduct many different warfare areas simultaneously. These include the ability to defend itself from attacks from submarines, mines, ships, aircraft and missiles. Other nations do not possess the same integrated warfare capabilities as the United States. As a result, many foreign nations' measures are focused solely on reducing what they perceive to be impacts involving ASW. They are not required to locate training areas and position naval forces for the simultaneous and integrated warfare elements that the Navy conducts. As a result, many nations are willing to move training to areas where they believe marine mammals may not exist and do not train in the same bathymetric and littoral environments.

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6 Other Considerations

6 OTHER CONSIDERATIONS REQUIRED BY THE NATIONAL ENVIRONMENTAL POLICY ACT

6.1 CONSISTENCY WITH OTHER FEDERAL, STATE, AND LOCAL PLANS, POLICIES, AND REGULATIONS

Based on an evaluation with respect to consistency with statutory obligations, the Department of the Navy's alternatives, including the Proposed Action, for the Gulf of Alaska Navy Training Activities (GOA NTA) Final Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS), hereby referred to as the EIS/OEIS, does not conflict with the objectives or requirements of federal, state, regional, or local plans, policies, or legal requirements. Table 6-1 provides a summary of environmental compliance requirements that may apply.

Table 6-1: Summary of Environmental Compliance for the Proposed Action

Plans, Policies, and Controls	Responsible Agency	Status of Compliance
National Environmental Policy Act (NEPA) of 1969 (42 United States Code [U.S.C] §§ 4321 et seq.) Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [C.F.R.] §§ 1500-1508) Navy Procedures for Implementing NEPA (32 C.F.R. § 775)	Navy	Navy training activities that occur within the United States (U.S.). Air Force (Air Force) inland Special Use Airspace (SUA) and the U.S. Army (Army) training lands are analyzed under previous NEPA documentation (the *Alaska Military Operations Areas EIS* [USAF 1995], *Improvements to Military Training Routes in Alaska Environmental Assessment* [USAF 2007], *Alaska Army Lands Withdrawal Renewal Final Legislative EIS* [Army 1999], and the *Transformation of U.S. Army Alaska FEIS* [Army 2004]). These documents are incorporated by reference. Public participation and review of this EIS/OEIS is being conducted in compliance with NEPA.
Executive Order (EO) 12114, 32 C.F.R. 187, Environmental Effects Abroad of Major Federal Actions	Navy	This EIS/OEIS has been prepared in accordance with EO 12114 as implemented by 32 C.F.R. 187, which requires environmental consideration for actions that may affect the global commons and the environment outside of U.S. territorial waters within the U.S. Exclusive Economic Zone (EEZ) and on the high seas.
Federal Water Pollution Control Act (Clean Water Act [CWA]) (33 U.S.C. §§ 1344 et seq.)	U.S. Environmental Protection Agency (USEPA)	No permits are required under the CWA Sections 401, 402, or 404 (b) (1), since the activities in GOA occur outside 12nm and the proposed action does not involve construction.
Rivers and Harbors Act (33 U.S.C.§§ 401 et seq.)	U.S. Army Corps of Engineers	No permit is required under the Rivers and Harbors Act as no construction in navigable waterways is proposed.

Table 6-1: Summary of Environmental Compliance for the Proposed Action (continued)

Plans, Policies, and Controls	Responsible Agency	Status of Compliance
Coastal Zone Management Act (CZMA) (16 C.F.R. §§ 1451 et seq.)	Alaska Department of Natural Resources (ADNR)	The Navy prepared a *de minimis* determination for compliance with the CZMA and, on October 14, 2010, received concurrence from the ADNR on that determination. See Section 6.1.1 for discussion of Navy activities and compliance with the CZMA.
Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801-1802)	National Marine Fisheries Service (NMFS)	The Navy prepared an Essential Fish Habitat Assessment (EFHA) to determine if the Proposed Action would have adverse affects to Essential Fish Habitat (EFH) within the TMAA. The EFHA determined that due to the temporary and minimal nature of Navy training activities in the TMAA, the Proposed Action would not have adverse effects to EFH within the TMAA. The EFHA was provided to NMFS Alaska Region for informational purposes on August 2, 2010. On January 4, 2011, NMFS Alaska Region disagreed with the Navy's conclusion of no adverse affects to EFH due to acoustic and expended materials impacts to EFH and provided four conservation recommendations to the Navy. On January 24, 2011, the Navy responded to these conservation recommendations in a letter to NMFS Alaska.
Endangered Species Act (ESA) (16 U.S.C. §§ 1531 et seq.)	U.S. Fish and Wildlife Service (USFWS) NMFS	The EIS/OEIS analyzes potential effects to species listed under the ESA. In accordance with ESA requirements, the Navy entered into consultation under Section 7 of the ESA with NMFS and USFWS on the potential that implementation of the Proposed Action may affect threatened and endangered listed species. Informal consultation for listed marine birds has been completed with USFWS with their concurrence letter of March 24, 2010. Consultation for listed marine species, including mammals, turtles, and fish, has been initiated with NMFS. Upon concluding Section 7 consultation, the Navy will adhere to any provisions of the Biological Opinion (BO).
Marine Mammal Protection Act (MMPA) (16 U.S.C. §§ 1431 et seq.)	NMFS	The MMPA governs activities with the potential to harm, disturb, or otherwise "harass" marine mammals. As a result of acoustic effects associated with mid-frequency active sonar use and underwater detonations of explosives, implementation of the alternatives including the Proposed Action may result in potential Level A (harm) or Level B (disturbance) harassment to marine mammals. Therefore, the Navy has submitted an application for a Letter Of Authorization (LOA) from NMFS to permit takes of marine mammals. A Notice of Receipt of the Navy's LOA application was published by NMFS on February 3, 2010. A Proposed Rule was published by NMFS on October 19, 2010, and was subjected to a 30-day public comment period. A Final Rule will be published for 30 days before becoming effective, and then a LOA permit will be issued to the Navy. The Navy will adhere to any provisions of the LOA and the monitoring plan.

Table 6-1: Summary of Environmental Compliance for the Proposed Action (continued)

Plans, Policies, and Controls	Responsible Agency	Status of Compliance
The Sikes Act of 1960 (16 U.S.C. §§ 670a-670o, as amended by the Sikes Act Improvement Act of 1997, Pub. L. No. 105-85)	Navy	No Navy installations are a part of the Proposed Action. Therefore, no trigger exists for Sikes Act compliance.
National Historic Preservation Act (NHPA) (16 U.S.C. §§ 470 et seq.)	Navy	The Navy has determined that the Proposed Action would have no adverse effects on cultural and historic resources within the Temporary Maritime Activities Area (TMAA). This conclusion has been reviewed and agreed upon by the Alaska State Historic Preservation Office (SHPO) on May 18, 2010.
EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Navy	The Proposed Action would not result in any disproportionately high adverse human health or environmental effects on minority or low-income populations.
EO 13045, Protection of Children from Environmental Health Risks and Safety Risks	Navy	The Proposed Action would not result in environmental health and safety risks to children.
Alaska Native Claims Settlement Act of 1971 (ANCSA) (43 U.S.C. §§ 1601-1624)	Navy	No lands subject to aboriginal claims in Alaska exist within the TMAA. Therefore, there is no requirement for action by the Navy under the ANSCA.
EO 13089, Coral Reef Protection	Navy	No resources that are governed by this EO exist within the TMAA. Therefore, mitigation of effects will not be necessary for the protection of resources under EO 13089.
Migratory Bird Treaty Act (MBTA) (16 U.S.C. §§ 703-712)	USFWS	A review of the actions under the implementation of the alternatives presented (including the Proposed Action) shows that there would not be a significant adverse effect on a migratory bird population. Therefore, under 50 CFR § 21.15, there is no need to confer with USFWS regarding MBTA species.

6.1.1 Coastal Zone Management Act Compliance

The CZMA of 1972 (16 U.S.C. Section [§] 1451) encourages coastal states to be proactive in managing coastal zone uses and resources. The CZMA established a voluntary coastal planning program; participating states submit a Coastal Management Plan (CMP) to the National Oceanographic and Atmospheric Administration (NOAA) Office of Ocean and Coastal Resource Management (OCRM) for approval. Under CZMA, federal actions are required to be consistent, to the maximum extent practicable, with the enforceable policies of approved CMPs.

CZMA defines the coastal zone (16 U.S.C. § 1453) as extending, "to the outer limit of State title and ownership under the Submerged Lands Act." The coastal zone extends inland only to the extent necessary to control the shoreline. Excluded from the coastal zone are lands the use of which is by law subject solely to the discretion of, or which is held in trust by, the federal government (16 U.S.C. § 1453). Accordingly, federal military lands are not within the coastal zone. In the state of Alaska, CZMA coastal boundaries are determined by each individual Coastal Resource District pursuant to 11 Alaska Administrative Code (AAC) 114.220.

The State of Alaska has an approved CMP, Alaska Coastal Management Program (ACMP), which is found at Alaska Statutes Annotated (AS) Title 46 Chapter 40. The ACMP received federal approval from the NOAA in 1979 and Alaska has adopted, and OCRM has approved, additional changes to the ACMP since that date. The ACMP provides stewardship for Alaska's rich and diverse coastal resources to ensure a healthy and vibrant Alaskan coast that efficiently sustains long-term economic and environmental productivity. The Alaska Department of Natural Resources (ADNR) is the state's designated coastal management agency and is responsible for reviewing projects for consistency with the CMP and issuing coastal management decisions under the provisions of 11 AAC Code Chapters 110 and 112. Specific statewide standards for review under the ACMP are found at 11 AAC Chapter 112.

The CZMA federal consistency determination process includes a review of the Proposed Action to determine whether it has potential direct or indirect effects on coastal zone resources or uses under the provisions of the CMP. An in-depth examination of any such effects, and a determination on whether those effects are consistent to the maximum extent practicable with the state's enforceable policies, is then conducted by the action proponent. Specific standards of the ACMP that appear applicable to proposed training activities occurring in the TMAA are 11 AAC Chapter 112 Sections 300 ("Habitats"), and 310 ("Air, Land, and Water Quality).

For the activities covered in this Final EIS/OEIS, the Navy has ensured compliance with the CZMA through coordination with the ADNR and the submission of a *de minimis* determination under 15 C.F.R. § 930.33(a)(3)(i) on 29 July 2010. This was based on the Navy's determination that the activities analyzed under this EIS were expected to have only insignificant direct or indirect (secondary and cumulative) coastal effects. ADNR concurred with the *de minimis* determination on 14 October 2010.

6.2 Relationship Between Short-Term Use of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of particular concern. This means that choosing one option may reduce future flexibility in pursuing other options, or that committing a resource to a certain use may often eliminate the possibility for other uses of that resource.

The Proposed Action would result in both short- and long-term environmental effects. However, the Proposed Action would not be expected to result in any impacts that would reduce environmental productivity, permanently narrow the range of beneficial uses of the environment, or pose long-term risks to health, safety, or the general welfare of the public. The Navy is committed to sustainable training area management, including co-use of all the training areas of the Alaska Training Area (ATA) with the general public and commercial interests to the extent practicable, consistent with accomplishment of the Navy mission and in compliance with applicable law. This commitment to co-use will enhance the long-term productivity of the training areas throughout the ATA.

6.3 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES

NEPA requires that environmental analysis include identification of "any irreversible and irretrievable commitments of resources which would be involved in the Proposed Action should it be implemented." [NEPA Sec. 102 (2)(C)(v), 42 U.S.C. § 4332]. Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the uses of these resources have on future generations. Irreversible effects primarily result from the use or destruction of a specific resource (e.g., energy or minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., the disturbance of a cultural site).

For the alternatives including the Proposed Action, most resource commitments are neither irreversible nor irretrievable. Most impacts are short-term and temporary or, if long lasting, are negligible. No habitat associated with threatened or endangered species would be lost as result of implementation of the Proposed Action. Since there would be no building or facility construction, the consumption of materials typically associated with such construction (e.g., concrete, metal, sand, fuel) would not occur. Energy typically associated with construction activities would not be expended and irreversibly lost.

Implementation of the Proposed Action would require fuels used by aircraft, ships, and ground-based vehicles. Since fixed- and rotary-wing flight and ship activities could increase, relative total fuel use would increase. Therefore, total fuel consumption would increase and this nonrenewable resource would be considered irreversibly lost.

6.4 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL OF ALTERNATIVES AND MITIGATION MEASURES

Increased training activities in the ATA would result in an increase in energy demand over the No Action Alternative. This would result in an increase in fossil fuel consumption, mainly from aircraft, vessels, ground equipment, and power supply. Although the required electricity demands of increased intensity of land use would be met by the existing electrical generation infrastructure at the ATA, the alternatives would result in a net cumulative negative impact on the energy supply.

Energy requirements would be subject to any established energy conservation practices at each facility. No additional power generation capacity would be required for any of the activities. The use of energy sources has been minimized wherever possible without compromising safety or training activities. No additional conservation measures related to direct energy consumption by the proposed activities are identified.

6.5 NATURAL OR DEPLETABLE RESOURCE REQUIREMENTS AND CONSERVATION POTENTIAL OF VARIOUS ALTERNATIVES AND MITIGATION MEASURES

Resources that will be permanently and continually consumed by project implementation include water, electricity, natural gas, and fossil fuels; however, the amount and rate of consumption of these resources would not result in significant environmental impacts or the unnecessary, inefficient, or wasteful use of resources. Nuclear-powered vessels would be a benefit as they decrease use of fossil fuels. Pollution prevention is an important component of mitigation of the alternative's adverse impacts. To the extent practicable, pollution prevention considerations are included.

Sustainable range management practices are in place that protect and conserve natural and cultural resources; and preservation of access to training areas for current and future training requirements, while addressing potential encroachments that threaten to impact range and training area capabilities.

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6 OTHER CONSIDERATIONS

No References in this section.

7 LIST OF PREPARERS

No References in this section.

9 Distribution List

9 DISTRIBUTION LIST

Following is a list of public officials, government agencies, Native American Tribes and Nations, organizations, and individuals who attended the public scoping meetings, provided comments during the scoping process, or have been identified by the Navy to be on the distribution list for the Gulf of Alaska Navy Training Activities Final Environmental Impact Statement/Overseas Environmental Impact Statement (FEIS/OEIS).

Federal and state regulatory agencies and project information repositories (noted below with an asterisk*) will receive both one (1) hard copy version and one (1) CD-ROM version of the Gulf of Alaska Navy Training Activities FEIS/OEIS. Stakeholders who have specifically requested a hard copy version will also receive one, along with a CD-ROM version. All other stakeholders will receive one (1) CD-ROM version. Additional hard copies and/or CD-ROM versions of the Final EIS/OEIS will be available upon request.

Information Repositories*

Loussac Library, Anchorage, AK

Alaska State Library, Juneau, AK

A. Holmes Johnson Memorial Library, Kodiak, AK

University of Alaska Fairbanks, Rasmussen Library, Fairbanks, AK

Cordova Public Library, Cordova, AK

Copper Valley Community Library, Glennallen, AK

Seward Community Library, Seward, AK

Humboldt Homer Public Library, Homer, AK

Federal Regulatory Agencies

Federal Aviation Administration
- Washington D.C. headquarters
- Alaska Region
- Navy Liaison Officer*

Marine Mammal Commission*

National Oceanic and Atmospheric Administration

National Marine Fisheries Service
- Washington D.C. headquarters*
- Alaska Region*
- Office of Protected Resources
- Habitat Conservation Division
- Alaska Fisheries Science Center

North Pacific Fisheries Management Council*

U.S. Army Corps of Engineers
- Alaska District

U.S. Department of the Air Force*

U.S. Department of the Army
-Environmental Resources Division*

U.S. Coast Guard
- Headquarters Office of Operating and Environmental Standards*
- District 17

U.S. Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
- Environmental Policy & Compliance Department*
- Minerals Management Service, Alaska Outer Continental Shelf Region*
- National Park Service, Glacier Bay*
- U.S. Fish & Wildlife Service, Alaska Region*
- U.S. Geological Survey, Alaska Science Center and Western Fisheries Research Center*

U.S. Environmental Protection Agency
- Washington D.C. headquarters*
- Region X*

U.S. Fish and Wildlife Service

U.S. Department of Agriculture
-U.S. Forest Service, Alaska Region

U.S. Department of Commerce

State Regulatory Agencies

Alaska Department of Fish and Game

Alaska Department of Natural Resources

Alaska Department of Commerce and Economic Development

Alaska Department of Environmental Conservation

Alaska Department of Transportation & Public Facilities

Alaska Office of History and Archaeology

Regulatory Commission of Alaska

Alaska Department of Military and Veterans Affairs

Native American Tribes and Nations*

Kaguyak Village

Lesnoi Village

Native Village of Afognak

Native Village of Chenega

Native Village of Eyak

Native Village of Old Harbor

Native Village of Ouzinkie

Native Village of Port Graham

Native Village of Port Lions

Native Village of Tatitlek

Shoonaq Tribe of Kodiak

Yakutat Tlingit Tribe

Federal Elected Officials

U.S. Representative
Hon. Donald Young, AK

U.S. Senator
Hon. Lisa Murkowski, AK

U.S. Senator
Hon. Mark Begich, AK

State Elected Officials

Governor of Alaska
Hon. Sean Parnell

Alaska State Senator
Hon. Bert Stedman,
AK District A

Alaska State Senator
Hon. Dennis Egan,
AK District B

Alaska State Senator
Hon. Albert Kookesh,
AK District C

Alaska State Senator
Hon. Joe Thomas,
AK District D

Alaska State Senator
Hon. Joe Paskvan,
AK District E

Alaska State Senator
Hon. Gene Therriault,
AK District F

Alaska State Senator
Hon. Linda Menard,
AK District G

Alaska State Senator
Hon. Charlie Huggins,
AK District H

Alaska State Senator
Hon. Fred Dyson,
AK District I

Alaska State Senator
Hon. Bill Wielechowski,
AK District J

Alaska State Senator
Hon. Bettye Davis,
AK District K

Alaska State Senator
Hon. Johnny Ellis,
AK District L

Alaska State Senator
Hon. Hollis French,
AK District M

Alaska State Senator
Hon. Lesil McGuire,
AK District N

Alaska State Senator
Hon. Kevin Meyer,
AK District O

Alaska State Senator
Hon. Con Bunde,
AK District P

Alaska State Senator
Hon. Thomas Wagoner,
AK District Q

Alaska State Senator
Hon. Gary Stevens,
AK District R

Alaska State Senator
Hon. Lyman Hoffman,
AK District S

Alaska State Senator
Hon. Donald Olson,
AK District T

Alaska State Representative
Hon. Kyle Johansen,
AK District 1

Alaska State Representative
Hon. Peggy Wilson,
AK District 2

Alaska State Representative
Hon. Beth Kerttula,
AK District 3

Alaska State Representative
Hon. Cathy Munoz,
AK District 4

Alaska State Representative
Hon. Bill Thomas, Jr.
AK District 5

Alaska State Representative
Hon. Woodie Salmon,
AK District 6

Alaska State Representative
Hon. Mike Kelly,
AK District 7

Alaska State Representative
Hon. David Guttenberg,
AK District 8

Alaska State Representative
Hon. Scott Kawaski,
AK District 9

Alaska State Representative
Hon. Jay Ramras,
AK District 10

Alaska State Representative
Hon. John Coghill,
AK District 11

Alaska State Representative
Hon. John Harris,
AK District 12

Alaska State Representative
Hon. Carl Gatto,
AK District 13

Alaska State Representative
Hon. Wes Keller,
AK District 14

Alaska State Representative
Hon. Mark Neuman,
AK District 15

Alaska State Representative
Hon. Bill Stoltze,
AK District 16

Alaska State Representative
Hon. Anna Fairclough,
AK District 17

Alaska State Representative
Hon. Nancy Dahlstrom,
AK District 18

Alaska State Representative
Hon. Pete Peterson,
AK District 19

Alaska State Representative
Hon. Max Gruenberg,
AK District 20

Alaska State Representative
Hon. Harry Crawford,
AK District 21

Alaska State Representative
Hon. Sharon Cissna,
AK District 22

Alaska State Representative
Hon. Les Gara,
AK District 23

Alaska State Representative
Hon. Berta Gardner,
AK District 24

Alaska State Representative
Hon. Mike Doogan,
AK District 25

Alaska State Representative
Hon. Lindsey Holmes,
AK District 26

Alaska State Representative
Hon. Bob Buch,
AK District 27

Alaska State Representative
Hon. Craig Johnson,
AK District 28

Alaska State Representative
Hon. Chris Tuck,
AK District 29

Alaska State Representative
Hon. Charisse Millet,
AK District 30

Alaska State Representative
Hon. Bob Lynn,
AK District 31

Alaska State Representative
Hon. Mike Hawker,
AK District 32

Alaska State Representative
Hon. Kurt Olson,
AK District 33

Alaska State Representative
Hon. Mike Chenault,
AK District 34

Alaska State Representative
Hon. Paul Seaton,
AK District 35

Alaska State Representative
Hon. Alan Austerman,
AK District 36

Alaska State Representative
Hon. Bryce Edgmon,
AK District 37

Alaska State Representative
Hon. Bob Herron,
AK District 38

Alaska State Representative
Hon. Richard Foster,
AK District 39

Alaska State Representative
Hon. Reggie Joule,
AK District 40

Local Elected Officials

Fairbanks North Star Borough
Hon. Luke Hopkins
Mayor

Kenai Peninsula Borough
Hon. David R. Carey
Mayor

Kodiak Island Borough
Hon. Jerome M. Selby
Mayor

Matanuska-Susitna Borough
Hon. Talis Colberg
Mayor

Municipality of Anchorage
Hon. Dan Sullivan
Mayor

City of Cordova
Hon. Timothy L. Joyce
Mayor

City/Borough of Juneau
Hon. Bruce Botelho
Mayor

Individuals

Andrea Altman
Kodiak, AK

Ellen Americus
Cordova, AK

Claudia Anderson
Kodiak, AK

Mark Anderson
Juneau, AK

Tom Anderson
Cordova, AK

Robert Archibald
Homer, AK

Wendy Armstrong
Cordova, AK

Brad Barr
Kodiak, AK

Jay Barrett
Kodiak, AK

Wendy Beck
Kodiak, AK

Robert Berceli
Cordova, AK

Frank Bergstrom
Juneau, AK

Allison Bidlack
Cordova, AK

Nancy Bird
Cordova, AK

Cheryl Boehlan
Kodiak, AK

Mary Ann Brant
Juneau, AK

Richard Brenner
Cordova, AK

Greg and Tina Brown
Juneau, AK

Roark Brown
Homer, AK

Bruce Cain
Cordova, AK

Mark Cammrys
Cordova, AK

Sally Campbell
Cordova, AK

Madelene Caselli
Palmer, AK

Dorothy Childers
Anchorage, AK

Sue Christiansen
Fritz Creek, AK

Amy Christiansen
Homer, AK

Al Clayton
Anchorage, AK

Taral Clayton
Anchorage, AK

Trevor Clayton
Anchorage, AK

Laurie Craig
Juneau, AK

Brendan Cummings
Joshua Tree, CA

Mark Cummings
Cordova, AK

Terry Cummings
Anchorage, AK

Dean Cwrzah
Kodiak, AK

Brian P. Delay
Auke Bay, AK

Tess Dietrich
Kodiak, AK

Andrea Doll
Juneau, AL

Brenda Dolma
Homer, AK

Margie Draskovich
Kodiak, AK

Don Dunn
Kodiak, AK

Jennifer Ewald
Cordova, AK

Richard Farnell
Juneau, AK

James Fisher
Soldotna, AK

Robert Fisher
Kingwood, TX

Chris Fredell
Juneau, AK

Cristy Fry
Homer, AK

Jennifer Gibbons
Cordova, AK

Susan Glinton
Nassau, Bahamas

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Homer, AK

Lavonne Heacock
Rhododendron, OR

Carolyn Heitman*
Kodiak, AK

Pat Heitman
Kodiak, AK

Leona Heitsch
Bourbon, MI

Janice Hollender
Juneau, AK

Pat Holmes
Kodiak, AK

Marilyn Holmes
Juneau, AK

Daniel Holt
Juneau, AK

Todd C. Hoppe
Homer, AK

John Hurley
Homer, AK

Mark Jamison
Kodiak, AK

Deb Jaros
Kodiak, AK

Michael Jasny
Santa Monica, CA

Leonard R. Johnson
Juneau, AK

Kyle F. Kaker
Juneau, AK

Joanna Kappele
Chicago, IL

Lee Keller
Seward, AK

Rich Kleinleder
Homer, AK

Robert Kopchak
Cordova, AK

Aldone Kowenta
Kodiak, AK

Kurt Krieter
Palmer, AK

David Kubiak
Kodiak, AK

Alexis Kwachka
Kodiak, AK

Dave Lacey
Fairbanks, AK

Tom Lakosh
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Cordova, AK

Don Lane
Homer, AK

Dune Lankard
Cordova, AK

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Sitka, AK

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Cordova, AK

Ann Mallard
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Craig Matkin
Homer, AK

Diane Mayer
Juneau, AK

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Cordova, AK

Irene Miramontes
Nassau, Bahamas

Maria Nasif
Tuscon, AZ

Cheryl Nugent
Kodiak, AK

Troy Ottosa
Cordova, AK

Alan Parks
Homer, AK

Susan Payne
Kodiak, AK

Genevieve Pearson
Kodiak, AK

Susan Peehl
Cold Spring, NY

W. Scott Pegan
Cordova, AK

Theresa Peterson
Kodiak, AK

Andrea Peterson
Juneau, AK

Nick Pugmire
Juneau, AK

Connie Quinley
Anchorage, AK

Francie Roberts
Homer, AK

Carolyn Roesbery
Cordova, AK

Bonita Rohla
Douglas, AK

Mark Rorick
Juneau, AK

Barbara Sachau
Florham Park, NJ

Gabe Scott
Cordova, AK

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Homer, AK

Whit Sheard
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Kodiak, AK

Joan Stempniak
Homer, AK

Dany Stihl
Kodiak, AK

Michael Stoker
Lagunitas, CA

Delores Stokes
Kodiak, AK

Richard Stokes
Juneau, AK

Stacy Studebaker
Kodiak, AK

Rick Swenson
Homer, AK

John F. Thomas
Cordova, AK

Kip Thomet
Kodiak, AK

Hans Tschersich
Kodiak, AK

Keith Van den Broek
Cordova, AK

Rochelle van den Broek
Cordova, AK

Mark Vinsell
Juneau, AK

Barbara Volpe
Kodiak, AK

Barbara Volpe
Kodiak, AK

Olga von Ziegesar
Fritz Creek, AK

Murray and Sara Walsh
Juneau, AK

Jon Warrenchuk
Juneau, AK

Charles K. Weaverling
Cordova, AK

Elise Wolf
Fritz Creek, AK

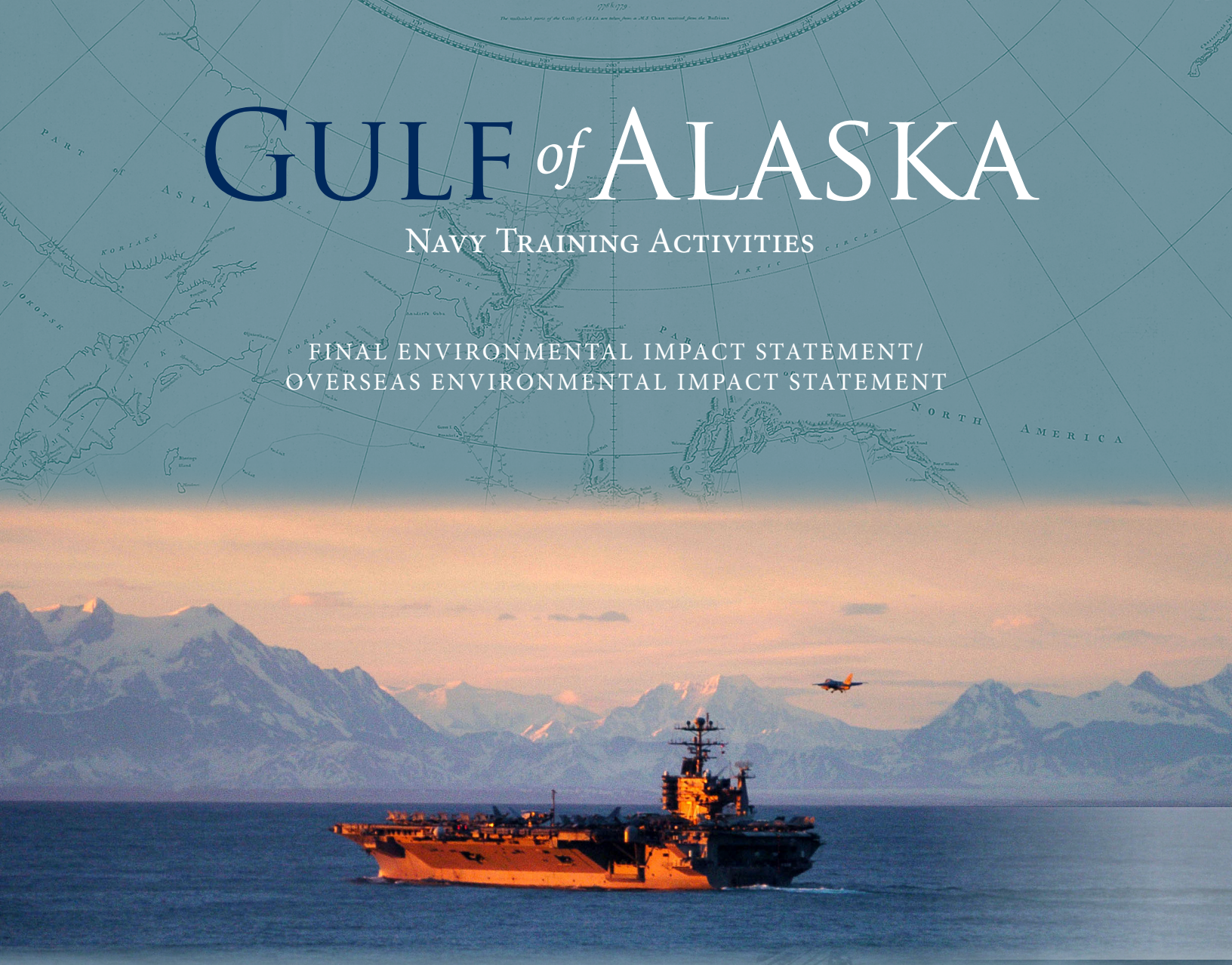
Stephanie Zuniga
Homer, AK

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GULF of ALASKA

Navy Training Activities

FINAL ENVIRONMENTAL IMPACT STATEMENT/
OVERSEAS ENVIRONMENTAL IMPACT STATEMENT



March 2011
Final EIS/OEIS
Volume Two

COMMANDER
UNITED STATES PACIFIC FLEET

Gulf of Alaska Navy Training Activities
Preliminary Final Environmental Impact Statement/ Overseas Environmental Impact Statement

Commander, U.S. Pacific Fleet
Environmental - N01CE1
250 Makalapa Dr., Bldg 251
Pearl Harbor, HI 96860-3131

Appendices A-I
Volume 2

MARCH 2011

Appendix A

Federal Register Notices

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NOTICE OF INTENT TO PREPARE AN ENVIRONMENTAL IMPACT STATEMENT FOR NAVY TRAINING ACTIVITIES IN THE GULF OF ALASKA

ENVIRONMENTAL PROTECTION AGENCY-NOTICE OF AVAILABILITY

NOTICE OF PUBLIC HEARINGS FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT FOR THE GULF OF ALASKA NAVY TRAINING ACTIVITIES

NOTICE OF PUBLIC HEARINGS FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT FOR THE GULF OF ALASKA NAVY TRAINING ACTIVITIES; CORRECTION

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Inquiries regarding field Service Record Books/Officer Qualification Records of current members should be addressed to the Commanding Officer of the Marine Corps unit to which they are attached.

Official mailing addresses are published in the Standard Navy Distribution List that is available at *http://doni.daps.dla.mil/sndl.aspx*.

Requests should contain the member's full name, Social Security Number (SSN) (and/or enlisted or officer service number), rank/rate, approximate dates of service, address, and signature of the requester. Transfer or Discharge (DD Form 214), discharge certificate, driver's license, or other data sufficient to ensure that the member is the subject of the record.

Current members (active and reserve) and former members may visit any of the above activities for review of records. Proof of identification will be required and may consist of an individual's active, reserve, or retired identification card, Armed Forces Report of.

RECORD ACCESS PROCEDURES:

Individuals seeking access to records about themselves contained in this system of records should address written requests to the following officials:

Inquiries regarding permanent Official Military Personnel File records of all active duty and reserve members, former members discharged, deceased, or retired after 31 December 1997 should be addressed to the Commandant of the Marine Corps (Code MMSB), Headquarters, U.S. Marine Corps, 2008 Elliot Road, Quantico, VA 22134–5030.

Inquiries regarding field Service Record Books/Officer Qualification Records of reserve members serving in the Individual Ready Reserve should be addressed to the Commanding General, Marine Corps Mobilization Command, 15303 Andrews Road, Kansas City, MO 64147–1207.

Inquiries regarding Official Military Personnel File records of former members discharged, deceased, or retired before 1 January 1998 should be addressed to the Director, National Personnel Records Center, Military Personnel Records, 9700 Page Avenue, St. Louis, MO 63132–5100.

Veterans and relatives of deceased veterans may obtain information on how to obtain copies of records from the National Personnel Records Center Web site at *http://www.archives.gov/st-louis/military-personnel/index.html*.

Inquiries regarding field Service Record Books/Officer Qualification Records of current members should be addressed to the Commanding Officer of the Marine Corps unit to which they are attached.

Official mailing addresses are published in the Standard Navy Distribution List that is available at *http://doni.daps.dla.mil/sndl.aspx*.

Requests should contain the member's full name, Social Security Number (SSN) (and/or enlisted or officer service number), rank/rate, approximate dates of service, address, and signature of the requester.

Current members (active and reserve) and former members may visit any of the above activities for review of records. Proof of identification will be required and may consist of an individual's active, reserve, or retired identification card, Armed Forces Report of Transfer or Discharge (DD Form 214), discharge certificate, driver's license, or other data sufficient to ensure that the member is the subject of the record.

CONTESTING RECORD PROCEDURES:

The USMC rules for contesting contents and appealing initial agency determinations are published in Secretary of the Navy Instruction 5211.5; Marine Corps Order P5211.2; 32 CFR part 701; or may be obtained from the system manager.

RECORD SOURCE CATEGORIES:

Staff agencies and subdivisions of Headquarters, U.S. Marine Corps; Marine Corps commands and organizations; other agencies of federal, state, and local government; medical reports; correspondence from financial and other commercial enterprises; correspondence and records of educational institutions; correspondence of private citizens addressed directly to the Marine Corps or via the U.S. Congress and other agencies; investigations to determine suitability for enlistment, security clearances, and special assignments; investigations related to disciplinary proceedings; and the individual of the record.

EXEMPTIONS CLAIMED FOR THE SYSTEM:

None.

[FR Doc. E8–5349 Filed 3–14–08; 8:45 am]

BILLING CODE 5001–06–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Intent To Prepare an Environmental Impact Statement and Overseas Environmental Impact Statement for Navy Training Activities in the Gulf of Alaska

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: Pursuant to section 102(2)(c) of the National Environmental Policy Act of 1969 (NEPA) as implemented by the Council on Environmental Quality regulations (40 CFR Parts 1500–1508), and Executive Order 12114 (Environmental Effects Abroad of Major Federal Actions), the Department of the Navy (Navy) announces its intent to prepare an Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) to evaluate the potential environmental effects of conducting Navy training in and around the Gulf of Alaska (GOA), including participation in large-scale Joint exercises, to support Fleet training exercise requirements. The Navy will invite the U.S. Fish and Wildlife Service and National Marine Fisheries Service to be cooperating agencies in preparation of this EIS/OEIS.

DATES AND ADDRESSES: Three public scoping meetings will be held to receive oral and/or written comments on environmental concerns that should be addressed in the EIS/OEIS. Each of the three scoping meetings will consist of an informal, open house session with information stations staffed by Navy representatives. The public scoping meetings will be held at the following dates, times, and locations:

1. Tuesday, April 1, 2008, 6 p.m. to 9 p.m., at Kodiak Best Western, 236 W. Rezanof Drive, Kodiak, AK 99615,

2. Wednesday, April 2, 2008, 6 p.m. to 9 p.m., at Kincaid Outdoor Center, North Assembly Room, 9401 W. Raspberry Road, Anchorage, AK 99502,

3. Thursday, April 3, 2008, 6 p.m. to 9 p.m., at Mt. Eccles Elementary School, 200 Adams Street, Cordova, AK 99574.

Details of the meeting locations and times will be announced in local newspapers. Additional information concerning meeting times will be available on the EIS/OEIS Web page located at: *http://www.GulfofAlaskaNavyEIS.com*.

FOR FURTHER INFORMATION CONTACT: Mrs. Amy Burt, Naval Facilities Engineering Command, Northwest, 1101 Tautog Circle Suite 203, Silverdale, Washington 98315–1101, Attn: GOA Navy Training Activities EIS/OEIS Project Manager,

Code EV1.AB, telephone number: 360–396–0924.

SUPPLEMENTARY INFORMATION: The proposed EIS/OEIS analyzes potential environmental effects of Navy training activities that will take place in and around the Gulf of Alaska and those aircraft events that originate in the maritime exercise area (MEA) and extend over established inland Alaska military operating areas. Navy training activities primarily take place in, or originate from, the MEA. The MEA provides approximately 42,000 nm^2 (144,056 km^2) of air and surface/subsurface ocean operating area and overlying airspace.

The MEA is a polygon that is oriented from northwest to southeast, approximately 300 nm in length by 150 nm in width, situated south of Prince William Sound and east of Kodiak Island, Alaska. The EIS/OEIS study area includes Gulf of Alaska ocean area within approximately 200 km from the MEA and the waters within this boundary up to the coastline. Military operations also occur over established land-based Military Operating Areas maintained by the Air Force in Alaska.

These Alaska training areas are used to conduct Navy training, including participating in large-scale Joint training exercises such as the annual Northern Edge exercise, involving military hardware, personnel, tactics, munitions, explosives, and electronic combat. Alaska is an ideal location to support naval and joint operational readiness by providing the maritime component to a ''geographically realistic'' range for U.S. Pacific Command (PACOM) and U.S. Northern Command (NORTHCOM) scenario-based training.

The purpose of the Proposed Action is to: (1) Support PACOM and NORTHCOM training requirements; (2) achieve and maintain Fleet readiness using these Alaska training areas to support and conduct current, emerging, and future training activities; (3) accommodate new training requirements associated with the introduction of new weapons and systems to the Fleet; and (4) support civilian authorities in homeland defense training exercises.

The need for the Proposed Action is to: (1) Maintain current levels of military readiness; (2) accommodate future increases in training activities to support Fleet exercise requirements in the Alaska training areas; (3) support the acquisition and implementation into the Fleet of advanced military technology; and (4) maintain the long-term viability of the Alaska training areas as a Navy training area while protecting human health and the environment, and enhancing the quality and the capabilities of the training area, including safety.

The No Action Alternative is the continuation of current training levels, with one carrier strike group per exercise, to exclude the use of mid-frequency active sonar (MFAS). Alternative 1 consists of an increase in the number of training activities from baseline levels, to include the use of MFAS, plus training associated with the introduction of new weapon systems, vessels, and aircraft into the Fleet. Alternative 2 consists of all elements of Alternative 1, plus the addition of a second summertime carrier strike group exercise each year, to include the use of MFAS.

Environmental issues that will be addressed in the EIS/OEIS include but are not limited to the following: Air quality; airspace; biological resources, including threatened and endangered species; cultural resources; geology and soils; hazardous materials and waste; health and safety; noise; socioeconomics; transportation and water resources.

The Navy is initiating the scoping process to identify community concerns and local issues that will be addressed in the EIS/OEIS. Federal, state, and local agencies, Alaska Native Federally-Recognized Tribes, the public, and interested persons are encouraged to provide oral and/or written comments to the Navy to identify specific environmental issues or topics of environmental concern that the commenter believes the Navy should consider. All comments, written or provided orally at the scoping meetings, will receive the same consideration during EIS/OEIS preparation.

Written comments on the scope of the EIS/OEIS should be postmarked no later than April 30, 2008. Comments may be mailed to: Mrs. Amy Burt, Naval Facilities Engineering Command, Northwest, 1101 Tautog Circle, Suite 203, Silverdale, Washington 98315–1101, Attn: GOA Navy Training Activities EIS/OEIS Project Manager, Code EV1.AB. Comments can also be submitted via the EIS/OEIS Web page located at *http://www.GulfofAlaskaNavyEIS.com*.

Dated: March 11, 2008.

T.M. Cruz,

Lieutenant, Judge Advocate General's Corps, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. E8–5316 Filed 3–14–08; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF ENERGY

Agency Information Collection Extension

AGENCY: U.S. Department of Energy.

ACTION: Notice and Request for Comments.

SUMMARY: The Department of Energy (DOE), pursuant to the Paperwork Reduction Act of 1995, intends to extend for three years, an information collection package with the Office of Management and Budget (OMB) concerning *Collection of Human Resource information from major DOE contractors for contract management, administration, and cost control.* Comments are invited on:

(a) Whether the extended collection of information is necessary for the proper performance of the functions of the agency, including whether the information shall have practical utility;

(b) The accuracy of the agency's estimate of the burden of the proposed collection of information, including the validity of the methodology and assumptions used;

(c) Ways to enhance the quality, utility, and clarity of the information to be collected; and

(d) Ways to minimize the burden of the collection of information on respondents, including through the use of automated collection techniques or other forms of information technology.

DATES: Comments regarding this proposed information collection must be received on or before May 16, 2008. If you anticipate difficulty in submitting comments within that period, contact the person listed below as soon as possible.

ADDRESSES: Written comments may be sent to: Robert M. Myers, U.S. Department of Energy, 1000 Independence Avenue, SW., Washington, DC 20585–1615, 202–287–1584, or by fax at 202–287–1656 or by e-mail at *robert.myers@hq.doe.gov.*

FOR FURTHER INFORMATION CONTACT: Requests for additional information or copies of the information collection instrument and instructions should be directed to Robert Myers at the address listed above.

SUPPLEMENTARY INFORMATION: This package contains:

(1) *OMB No.* 1910–0600;

(2) *Package Title:* Industrial Relations;

(3) *Type of Review:* Renewal;

(4) *Purpose:* This information is required for management oversight for the Department of Energy's Facilities Management Contractors and to ensure that the programmatic and

Approximately 400 Acres, Currently Operated by Los Angeles Harbor Department (LAHD), Located along the West Side of Los Angeles Harbor's Main Channel, from the Vincent Thomas Bridge to Cabrillo Beach, US Army Section 10 and 404 and Section 103 Marine Protection, Research, and Sanctuaries Act Permits, (MPRSA) City of Los Angeles, CA.

Summary: EPA continues to have concerns about the unavoidable air quality impacts to environmental justice communities.

EIS No. 20090335, ERP No. F–AFS–K65341–AZ, Black River Exchange Project, Proposal to Exchange Federal and Non-Federal Lands, Apache-Sitgreaves National Forests, Apache County, AZ.

Summary: EPA does not object to the proposed project.

EIS No. 20090347, ERP No. F–AFS–J65512–MT, Butte Lookout Project, Proposed Timber Harvest, Prescribed Burning, Road Work and Management Activities, Missoula Ranger District, Lola National Forest, Missoula County, MT.

Summary: EPA continues to have environmental concerns because significant portions of the proposed rehabilitative and restorative work are not currently funded. EPA encouraged timely funding of the remainder of the proposed rehabilitative and restorative work.

EIS No. 20090351, ERP No. F–AFS–J65503–WY, Thunder Basin National Grassland Prairie Dog Management Strategy, Land and Resource Management Plan Amendment #3, Proposes to Implement a Site-Specific Strategy to Manage Black Trailed Prairie Dog, Douglas Ranger District, Medicine Bow-Routt National Forests and Thunder Basin National Grassland, Campbell, Converse, Niobrara and Weston Counties, WY.

Summary: EPA continues to have environmental concerns About impacts to black-footed ferret habitat.

EIS No. 20090354, ERP No. F–USN–K11023–00, West Coast Basing of the MV–22 Determining Basing Location(s) and Providing Efficient Training Operations, CA, AZ.

Summary: EPA expressed environmental concerns about project-related noise impacts.

EIS No. 20090355, ERP No. F–AFS–K65361–CA, Thom-Seider Vegetation Management and Fuels Reduction Project, To Respond to the Increasing Density and Fuels Hazard Evident along the Klamath River between Hamburg and Happy Camp, Klamath National Forest, Siskiyou County, CA.

Summary: EPA does not object to the proposed project.

EIS No. 20090357, ERP No. F–NPS–H65028–MO, Jefferson National Expansion Memorial, General Management Plan, Implementation, St. Louis, MO.

Summary: EPA does not object to the proposed project.

EIS No. 20090359, ERP No. F–FHW–H40194–MO, MO–63 Corridor Improvement Project, To Correct Roadway Deficiencies, Reduce Congestion and Provide Continuity along the MO–63 Corridor on the Existing Roadway and on New Location, Osage, Maries and Phelps Counties, MO.

Summary: EPA continues to have environmental concerns about stream and wetland impacts, and requested additional mitigation.

EIS No. 20090361, ERP No. F–NOA–A91073–00, Programmatic—Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans, Bottomfish and Seamount Groundfish, Coral Reef Ecosystems, Crustaceans, Precious Corals, Pelagics, Implementation, American Samoa, Commonwealth of the Northern Mariana Islands, Hawaii, U.S. Pacific Remote Island Area.

Summary: No formal comment letter sent to the preparing agency.

Dated: December 12, 2009.

Robert W. Hargrove,

Director, NEPA Compliance Division, Office of Federal Activities.

[FR Doc. E9–29561 Filed 12–10–09; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[ER–FRL–8986–4]

Environmental Impacts Statements; Notice of Availability

Responsible Agency: Office of Federal Activities, General Information (202) 564–1399 or *http://www.epa.gov/compliance/nepa/.*

Weekly receipt of Environmental Impact Statements.

Filed 11/30/2009 Through 12/04/2009. Pursuant to 40 CFR 1506.9.

EIS No. 20090413, Final EIS, USFS, NV, Martin Basin Rangeland Project, Reauthorizing Grazing on Eight Existing Cattle and Horse Allotments: Bradshaw, Buffalo, Buttermilk, Granite Peak, Indian, Martin Basin, Rebel Creek, and West Side Flat Creek, Santa Rosa Ranger District, Humboldt-Toiyabe National Forest, NV, Wait Period Ends: 01/11/2010, Contact: Vernon Keller 775–355–5056.

EIS No. 20090414, Draft EIS, USFS, UT, Tropic to Hatch 138kV Transmission Line Project, Proposing Construction of a new 138 kV transmission Line that would replace some or all the existing 69 kV Transmission Line, Applications for Special-Use Permits and/or Right-of-Way Grants, Grand Staircase-Escalante National Monument Management Plan Amendment, Garfield County, UT, Comment Period Ends: 03/10/2010, Contact: Susan Baughman 435–865–3703.

EIS No. 20090415, Final EIS, FHWA, MI, Detroit Intermodal Freight Terminal (DIFT) Project, Proposes Improvement to Intermodal Freight Terminals in Wayne and Oakland Counties, MI, Wait Period Ends: 01/11/2010, Contact: David T. Williams 517–702–1820.

EIS No. 20090416, Final EIS, USMC, NC, U.S. Marine Corps Grow the Force at MCB Camp Lejeune, MCAS New River, and MCAS Cherry Point, To Provide the Infrastructure to Support the Permanent Increases at these three Installation, US Army Corps Section 404 and 10 Permits, City of Jacksonville, NC, Wait Period Ends: 01/11/2010, Contact: Michael H. Jones 757–322–4942.

EIS No. 20090417, Final EIS, NOAA, 00, Comprehensive Ecosystem-Base Amendment 1 (CE–BA 1) for the South Atlantic Region, Implementation, Wait Period Ends: 01/11/2010, Contact: Roy E. Crabtree, PhD 727–824–5305

EIS No. 20090418, Draft EIS, USACE, NC, The Town of Nags Head Beach Nourishment Project, Propose to Utilize a Self-Contained Hooper Dredge and Other Feasible Dredging Equipment during a Proposed Construction Window from April through September, Dare County, NC, Comment Period Ends: 01/25/2010, Contact: Raleigh Bland 910–251–4564.

EIS No. 20090419, Draft EIS, USACE, MN, U.S. Steel Keetac Taconite Mine Expansion Project, Propose to Restart an Idled Production Line and Expand Contiguous Sections of the Open Pit Iron Ore Mine, located near Keewatin, Itasca and St. Louis Counties, MN, Comment Period Ends: 01/27/2010, Contact: Ralph Augustin 651–290–5378.

EIS No. 20090420, Final EIS, FHWA, IN, I–69 Evansville to Indianapolis, Indiana Project, Section 3, Washington to Crane NSWC (US 50 to US 231), Daviess, Greene, Knox and Martin Counties, IN, Wait Period Ends: 01/11/2010, Contact: Janice Osadczuk 317–226–7486.

EIS No. 20090421, Draft Supplement, NRC, WY, Moore Ranch In-Situ Uranium Recovery (ISR) Project, Proposal to Construct, Operate, Conduct Aquifer Restoration, and Decommission an In-Situ Recovery (ISR) Facility, NUREG–1910, Campbell County, WY, Comment Period Ends: 02/01/2010, Contact: Behram Shroff 301–415–0666.

EIS No. 20090422, Final EIS, BR, KS, Equus Beds Aquifer Storage Recharge and Recovery Project, To Provide Municipal and Industrial (M&I) Water to City and Surrounding Region, Equus Beds Division, Wichita Project, Kansas, Harvey, Sedgwick, and Reno Counties, KS, Wait Period Ends: 01/11/2010, Contact: Charles F. Webster 405–470–4831.

EIS No. 20090423, Second Draft Supplement, NRC, WY, Nichols Ranch In-Situ Uranium Recovery (ISR) Project, Proposal to Construct, Operate, Conduct Aquifer Restoration, and Decommission and In-Situ Recovery Uranium Milling Facility, Campbell and Johnson Counties, WY, Comment Period Ends: 02/01/2010, Contact: Irene Yu 301–415–1951.

EIS No. 20090424, Draft EIS, USN, AK, Gulf of Alaska Navy Training Activities, Proposal to Support and Conduct Current, Emering, and Future Training Activities, Implementation, Gulf of Alaska, AK, Comment Period Ends: 01/25/2010, Contact: Amy Burt 360–396–9024.

EIS No. 20090425, Third Draft Supplement, NRC, WY, Lost Creek In-Situ Uranium Recovery (ISR) Project, Proposal to Construct, Operate, Conduit Aquifer Restoration, and Decommission an In-Situ Recovery (ISR) Uranium Milling Facility, Sweetwater County, WY, Comment Period Ends: 02/01/2010, Contact: Alan B. Bjornsen 301–415–1195.

EIS No. 20090426, Draft EIS, FRA, VA, Richmond and the Hampton Roads Passenger Rail Project, Proposed Higher Speed Intercity Passenger Rail, VA, Comment Period Ends: 01/25/2010, Contact: John Winkle 202–493–6067.

EIS No. 20090427, Final EIS, NPS, MN, Disposition of Bureau of Mines Property, Twin Cities Research Center Main Campus, Implementation, Hennepin County, MN, Wait Period Ends: 01/11/2010, Contact: Steven P. Johnson 651–290–3030 Ext. 223.

Amended Notices

EIS No. 20090312, Draft EIS, USACE, OH, Cleveland Harbor Dredged Material Management Plan, Operations and Maintenance, Cuyahoga County, OH, Comment Period Ends: 02/01/2010, Contact: Frank O'Connor 716–879–4131. Revision to FR Notice Published 09/11/2009: Extending Comment Period from 12/07/2009 to 02/01/2010.

EIS No. 20090394, Draft EIS, USN, GU, Guam and Commonwealth of the Northern Mariana Islands (CNMI) Military Relocation, Proposed Relocating Marines from Okinawa, Visiting Aircraft Carrier Berthing, and Army Air and Missile Defense Task Force, Implementation, GU, Comment Period Ends: 02/17/2010, Contact: Kyle Fujimoto 808–472–1442. Revision to FR Notice Published 11/20/2009: Disregard the FR Notice of 11/28/2009: Correction to Comment Period from 01/04/2010 to 02/17/2010.

Dated: 12/08/2009.

Robert W. Hargrove,

Director, NEPA Compliance Division, Office of Federal Activities.

[FR Doc. E9–29562 Filed 12–10–09; 8:45 am]

BILLING CODE 6560–50–P

ENVIRONMENTAL PROTECTION AGENCY

[FRL–9090–1]

Issuance of a Final NPDES General Permit (GP) for Offshore Seafood Processors Discharging in Federal Waters Off the Alaska Shore (Permit Number AKG–524–000)

AGENCY: Environmental Protection Agency (EPA).

ACTION: Issuance of Final NPDES General Permit.

SUMMARY: On September 26, 2008, the Director, Office of Water and Watersheds, EPA Region 10, proposed to issue a general permit to cover offshore seafood processors discharging seafood processing waste off the shore of Alaska. During the 76-day comment period, EPA received comments from 11 people and has prepared a Response to Comments document to explain changes made in the permit and reasons for not making changes that were requested.

DATES: The permit will become effective March 1, 2010 and will expire February 28, 2015. The permit issuance date is December 28, 2009.

ADDRESSES: Copies of the General Permit and the Response to Comments may be requested from Audrey Washington, EPA Region 10, 1200 Sixth Avenue, Suite 900, OWW–130, Seattle, WA 98101–3140, by phone at (206) 553–0523, or by e-mail: *washington.audrey@epa.gov.*

FOR FURTHER INFORMATION CONTACT: Copies of the general permit and response to comments are available on the EPA Region 10 Web site at *http://yosemite.epa.gov/R10/WATER.NSF/NPDES+Permits/General+NPDES+Permits.*

SUPPLEMENTARY INFORMATION

A. Endangered Species Act

Section 7 of the Endangered Species Act requires EPA to consult with the U.S. Fish and Wildlife Service and National Marine Fisheries Service regarding the potential effects that an action may have on listed endangered or threatened species or their critical habitat. To address these ESA requirements, and in support of EPA's informal consultation with the Services, a Biological Evaluation (BE) was prepared to analyze these potential effects. The results of the BE concluded that discharges from Offshore Seafood Processing facilities will either have no effect or are not likely to adversely affect threatened or endangered species, their critical habitat, or essential fish habitat in the vicinity of the discharge. After reviewing the BE and permit the Services concurred with EPA's findings.

B. Executive Order 12866

The Office of Management and Budget has exempted this action from the review requirements of Executive Order 12866 pursuant to Section 6 of that order.

C. Paperwork Reduction Act

The information collection requirements of this permit were previously approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* and assigned OMB control numbers 2040–0086 (NPDES permit application) and 2040–0004 (discharge monitoring reports).

D. Unfunded Mandates Reform Act

Section 201 of the Unfunded Mandates Reform Act (UMRA), Public Law 104–4, generally requires federal agencies to assess the effects of their ''regulatory actions'' (defined to be the same as ''rules'' subject to the RFA) on tribal, state, and local governments and the private sector. However, general

currently developed. The project proposes to develop approximately 1,870 acres, and set aside 1,274 acres of wetland preserve/open space. The proposed action includes approximately 584 acres of commercial uses associated with the adjacent Mather Airport, 201 acres of commercial, 84 acres of aggregate extraction, 598 acres of university village/residential, 102 acres of parks and recreation, 274 acres for a regional sports park, and 27.4 acres for utilities and infrastructure. Approximately 124 acres of waters of the United States have been identified in the proposed project area, including 69.8 acres of vernal wetlands (pools and swales), 27.3 acres of depressional seasonal wetlands, 1.9 acres of ditches, 5.7 acres of lake/pond and 19.1 acres of other waters of the United States. The applicant has applied for permits to fill 35.39 acres of these waters. The approximately 1,274 acre open space and wetland preserve would contain approximately 47.3 acres of waters not directly impacted by the project. In addition, approximately 4.9 acres of wetlands at the west end of the Mather Airport runway would be avoided and placed under some type of protective agreement, but not a conservation easement.

The EIS will include an evaluation of a reasonable range of alternatives. Currently, at least four alternatives are expected to be analyzed in detail: (1) The no action alternative (no permit issued), (2) the applicant's preferred project (proposed action), (3) an offsite alternative, and (4) a reduced development footprint alternative. The no action alternative assumes limited development would occur in the Mather Specific Plan area with all waters of the United States avoided. The off-site alternative assumes the proposed project would be developed at a different but suitably-sized site in the region. A reduced development footprint alternative will have a smaller development footprint than the applicant's preferred project with less direct impacts to waters of the United States.

The Corps' scoping process for the EIS includes a public involvement program with several opportunities to provide oral and written comments. In addition to public meetings and notifications in the **Federal Register**, the Corps will issue public notices when the draft and final EISs are available. Affected Federal, State, and local agencies, Native American tribes, and other interested organizations and parties are invited to participate.

Potentially significant issues to be analyzed in the EIS include, but are not limited to: Hydrology, water supply, water quality, cultural resources, biological resources, traffic and transportation, and air quality.

The Corps is the lead agency for preparation of the EIS under the requirements of the National Environmental Policy Act (NEPA). The Corps will coordinate with the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service and Central Valley Regional Water Quality Control Board.

Other environmental review and consultation requirements for the proposed action include the need for the applicant to obtain water quality certification under Section 401 of the Clean Water Act from the Central Valley Regional Water Quality Control Board. In addition, because the proposed project may affect federally-listed endangered species, the Corps will formally consult with the U.S. Fish and Wildlife Service in accordance with Section 7 of the federal Endangered Species Act. The Corps will also be consulting with the State Historic Preservation Officer under Section 106 of the National Historic Preservation Act concerning properties listed, or potentially eligible for listing, on the National Register of Historic Places.

One public scoping meeting for the EIS will be held on January 6, from 4 p.m. to 7 p.m. Conference Room 170 located at 10545 Armstrong Avenue, Mather CA, 95655. Interested parties can provide oral and written comments at the meeting. Interested parties may also submit written comments on this notice. Scoping comments should be submitted before January 31, 2010, but may be submitted at any time prior to publication of the Draft EIS.

Interested parties may register for the Corps' public notice email notification lists at: *http://www.spk.usace.army.mil/organizations/cespk-co/regulatory/pnlist.html.*

Dated: November 30, 2009.

Thomas C. Chapman,

Colonel, Corps of Engineers, District Engineer.

[FR Doc. E9–29603 Filed 12–10–09; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Public Hearings for the Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: Pursuant to section 102(2)(c) of the National Environmental Policy Act (NEPA); the Council on Environmental Quality Regulations for implementing the procedural provisions of NEPA (Title 40 Code of Federal Regulations Parts 1500–1508); and Executive Order 12114, Environmental Effects Abroad of Major Federal Actions, the Department of the Navy (Navy) has prepared and filed with the U.S. Environmental Protection Agency a Draft Environmental Impact Statement/ Overseas Environmental Impact Statement (EIS/OEIS) for public release on December 11, 2009. The National Marine Fisheries Service (NMFS) is a Cooperating Agency for the EIS/OEIS.

The Draft EIS/OEIS evaluates the potential environmental effects of the Proposed Action from Navy training activities conducted in the Gulf of Alaska and Alaska's inland training areas, collectively referred to as the Alaska Training Areas (ATA). The Draft EIS/OEIS addresses ongoing and proposed military training activities, as well as proposed force structure changes and the introduction of new weapons and systems to the Fleet. The Proposed Action serves to achieve and maintain Fleet readiness using the ATA to support and conduct current, emerging, and future training activities. A Notice of Intent for this Draft EIS/OEIS was published in the **Federal Register** on March 17, 2008 (73 FR 14237).

The Navy will conduct five public hearings to receive oral and written comments on the Draft EIS/OEIS. Federal, State, and local agencies, elected officials, and other interested individuals and organizations are invited to be present or represented at the public hearings. This notice announces the dates and locations of the public hearings for this Draft EIS/OEIS.

An open house session will precede the scheduled public hearing at each of the locations listed below, and will allow individuals to review the information presented in the Draft EIS/ OEIS. Navy representatives will be available during the open house sessions to clarify information related to the Draft EIS/OEIS.

Dates and Addresses: Five public hearings will be held in Alaska to receive oral and written comments on the Draft EIS/OEIS. All meetings will start with an open house session from 5 p.m. to 7 p.m., followed by a presentation and formal public comment period from 7 p.m. to 8:30 p.m. Public hearings will be held on the following dates and at the following locations:

1. Thursday, January 7, 2010, at Kodiak High School Cafeteria, 722 Mill Bay Road, Kodiak, Alaska;

2. Friday, January 8, 2010, at Fairview Recreation Center Main Gymnasium, 1121 E. 10th Avenue, Anchorage, Alaska;

3. Saturday, January 9, 2010, at West Homer Elementary School Gymnasium, 995 Soundview Avenue, Homer, Alaska;

4. Monday, January 11, 2010, at Juneau Arts and Culture Center Main Hall, 350 Whittier Street, Juneau, Alaska;

5. Tuesday, February 12, 2010, at Orca Adventure Lodge Meeting Room & Café, 2500 Orca Road, Cordova, Alaska.

FOR FURTHER INFORMATION CONTACT: Naval Facilities Engineering Command Northwest, Attention: Mrs. Amy Burt, Gulf of Alaska Navy Training Activities EIS/OEIS Project Manager, 1101 Tautog Circle, Suite 203, Silverdale, WA 98315–1101; or *http://www.GulfofAlaskaNavyEIS.com.*

SUPPLEMENTARY INFORMATION: Air and sea training activities are conducted within the Gulf of Alaska Temporary Maritime Activities Area (TMAA) which is part of the ATA. The land, air, and sea components of the ATA provide the space and resources needed to realistically train Navy Sailors to achieve and maintain Fleet readiness. Navy air and sea training activities originate from Navy ships located within the TMAA. The TMAA is situated south of Prince William Sound and east of Kodiak Island and includes 42,146 square nautical miles of airspace, sea space, and undersea space. The Navy also conducts activities in established U.S. Air Force and U.S. Army inland training areas, which include more than 65,000 square miles of airspace and land area. The ATA serve as the principal training venue for annual joint training exercises, which can involve forces from the U.S. Navy, Air Force, Army, Coast Guard, and local, state, and nongovernmental agencies. The ATA are used for training activities including operating aircraft, ships, and submarines; conducting training against moving ships and aircraft; practicing aerial surveillance; and detecting and locating submarines.

The purpose of the Navy's Proposed Action is to: Achieve and maintain Fleet readiness using the ATA to support and conduct current, emerging, and future training activities.

The need for the Proposed Action is to: (1) Maintain current levels of military readiness by training in the ATA; (2) accommodate future increases in levels of training activities in the ATA; (3) adequately support the training need for new aircraft, ships, submarines, and weapons systems; (4) identify shortfalls in training, particularly training instrumentation, and address through enhancements; (5) maintain the long-term viability of the ATA as a Navy training area while protecting human health and the environment, and enhancing the quality, capabilities, and safety of the training area; and (6) be able to bring U.S. Army, Navy, Air Force, and Coast Guard assets together into one geographic area for joint training.

Under the No Action Alternative, training activities within the ATA would continue at current levels over a maximum time frame of 14 days. This alternative includes one annual Carrier Strike Group training exercise and excludes the use of mid-frequency active sonar. Alternative 1 proposes an increase in the number of training activities from current levels as necessary to support Fleet exercise requirements over a maximum time frame of 21 days in the summer months (April—October), to include the use of active sonar; and accommodates training enhancement instrumentation, including the use of a Portable Undersea Tracking Range, and force structure changes associated with the introduction of new weapon systems, vessels, and aircraft into the Fleet. Alternative 2, the Preferred Alternative, consists of all elements of Alternative 1. In addition, Alternative 2 includes an increase in the number of training activities over Alternative 1 levels by conducting a second annual Carrier Strike Group training exercise, which could also last up to 21 days in the summer months, and conducting a Sinking Exercise during each summertime exercise (a maximum of two).

The Draft EIS/OEIS addresses potential environmental impacts on multiple resources, including but not limited to: Air quality; water resources; biological resources; cultural resources; socioeconomics; and public health and safety.

No significant impacts are identified for most resources within the ATA that cannot be mitigated. The results of the analysis indicate, however, that while there is the possibility for physiological effects and altered behavior from sound in the water from active sonar and explosives, no mortality to marine mammals is anticipated. Furthermore, the estimation of sound exposures does not consider the Navy's use of protective measures, which would reduce the likelihood of exposures at the highest sound levels. The Navy has requested from NMFS a Letter of Authorization (LOA) in accordance with the Marine Mammal Protection Act to authorize the incidental take of marine mammals that may result from the implementation of the activities analyzed in the Gulf of Alaska Navy Training Activities Draft EIS/OEIS.

In accordance with Section 7 of the Endangered Species Act, the Navy is consulting with NMFS and U.S. Fish and Wildlife Service (USFWS) for potential impacts to federally listed species. Navy analysis has indicated that under the Clean Air Act requirements, while emissions over current levels may occur, these emissions would not exceed air quality standards, and under the Clean Water Act there would be no significant impacts to water quality. Analysis under the National Historic Preservation Act, in addition to other applicable laws and regulations, indicates that no significant impacts to cultural resources would occur if the Proposed Action or alternatives were implemented. Implementation of the Proposed Action or alternatives would not result in a significant adverse effect on the population of a migratory bird and fish species.

The decision to be made by the Navy is to determine which of the alternatives analyzed in the EIS/OEIS best meet the operational needs of the Navy given that all reasonably foreseeable environmental impacts have been considered.

The Draft EIS/OEIS was distributed to Federal, State, and local agencies, elected officials, and other interested individuals and organizations. The public comment period will end on January 25, 2010. Copies of the Draft EIS/OEIS are available for public review at the following libraries: Z.J. Loussac Library, Government Documents, 3600 Denali Street, Anchorage, AK; Alaska State Library, Government Documents, 333 Willoughby Avenue, 8th Floor, Juneau, AK; A. Holmes Johnson Memorial Library, 319 Lower Mill Bay Road, Kodiak, AK; University of Alaska Fairbanks, Rasmussen Library, Government Documents, 310 Tanana Loop, Fairbanks, AK; Cordova Public Library, 622 First Street, Cordova, AK; Copper Valley Community Library, Mile 186 Glenn Highway, Glennallen, AK; Seward Community Library, 238 5th Avenue, Seward, AK; Homer Public Library, 500 Hazel Avenue, Homer, AK.

The Gulf of Alaska Navy Training Activities Draft EIS/OEIS is also available for electronic public viewing at: *http://www.GulfofAlaskaNavyEIS.com.* A paper copy of the Executive Summary or a single CD with the Draft EIS/OEIS

will be made available upon written request by contacting Naval Facilities Engineering Command Northwest, Attention: Mrs. Amy Burt, Gulf of Alaska Navy Training Activities EIS/OEIS Project Manager, 1101 Tautog Circle, Suite 203, Silverdale, WA 98315–1101.

Federal, State, and local agencies, elected officials, and interested individuals and organizations are invited to be present or represented at the public hearing. Written comments can also be submitted during the open house sessions preceding the public hearings.

Oral statements will be heard and transcribed by a stenographer; however, to ensure the accuracy of the record, all statements should be submitted in writing. All statements, both oral and written, will become part of the public record on the Draft EIS/OEIS and will be responded to in the Final EIS/OEIS. Equal weight will be given to both oral and written statements. In the interest of available time, and to ensure all who wish to give an oral statement have the opportunity to do so, each speaker's comments will be limited to three (3) minutes. If you have prepared a written statement, you may read it out loud if you can do so within the three minute time limit, or you may turn it in at the public hearing or mail the statement to Naval Facilities Engineering Command Northwest, Attention: Mrs. Amy Burt, Gulf of Alaska Navy Training Activities EIS/OEIS Project Manager, 1101 Tautog Circle, Suite 203, Silverdale, WA 98315–1101. In addition, comments may be submitted online at *http://www.GulfofAlaskNavyEIS.com* during the comment period. All written comments must be postmarked by January 25, 2010, to ensure they become part of the official record. All comments will be addressed in the Final EIS/OEIS.

Dated: December 7, 2009.

A.M. Vallandingham,

Lieutenant Commander, Office of the Judge Advocate General, U.S. Navy, Federal Register Liaison Officer.

[FR Doc. E9–29565 Filed 12–10–09; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF DEFENSE

Defense Acquisition Regulations System

Waiver of 10 U.S.C. 2534 for Certain Defense Items Produced in the United Kingdom

AGENCY: Defense Acquisition Regulations System, Department of Defense (DoD).

ACTION: Notice of waiver of 10 U.S.C. 2534 for certain defense items produced in the United Kingdom.

SUMMARY: The Under Secretary of Defense (Acquisition, Technology, and Logistics) is waiving the limitation of 10 U.S.C. 2534 for certain defense items produced in the United Kingdom (UK). 10 U.S.C. 2534 limits DoD procurement of certain items to sources in the national technology and industrial base. The waiver will permit procurement of enumerated items from sources in the UK, unless otherwise restricted by statute.

DATES: *Effective Date:* This waiver is effective for one year, beginning December 28, 2009.

FOR FURTHER INFORMATION CONTACT: Ms. Patricia Foley, OUSD(AT&L), Office of the Director of Defense Procurement and Acquisition Policy, Contract Policy and International Contracting, Room 5E621, 3060 Defense Pentagon, Washington, DC 20301–3060, telephone (703) 693–1145.

SUPPLEMENTARY INFORMATION:

Subsection (a) of 10 U.S.C. 2534 provides that the Secretary of Defense may procure the items listed in that subsection only if the manufacturer of the item is part of the national technology and industrial base. Subsection (i) of 10 U.S.C. 2534 authorizes the Secretary of Defense to exercise the waiver authority in subsection (d), on the basis of the applicability of paragraph (2) or (3) of that subsection, only if the waiver is made for a particular item listed in subsection (a) and for a particular foreign country. Subsection (d) authorizes a waiver if the Secretary determines that application of the limitation ''would impede the reciprocal procurement of defense items under a memorandum of understanding providing for reciprocal procurement of defense items'' and if he determines that ''that country does not discriminate against defense items produced in the United States to a greater degree than the United States discriminates against defense items produced in that country.'' The Secretary of Defense has delegated the waiver authority of 10 U.S.C. 2534(d) to the Under Secretary of Defense (Acquisition, Technology, and Logistics).

DoD has had a Reciprocal Defense Procurement Memorandum of Understanding (MOU) with the UK since 1975, most recently renewed on December 16, 2004.

The Under Secretary of Defense (Acquisition, Technology, and Logistics) finds that the UK does not discriminate against defense items produced in the United States to a greater degree than the United States discriminates against defense items produced in the UK, and also finds that application of the limitation in 10 U.S.C. 2534 against defense items produced in the UK would impede the reciprocal procurement of defense items under the MOU.

Under the authority of 10 U.S.C. 2534, the Under Secretary of Defense (Acquisition, Technology, and Logistics) has determined that application of the limitation of 10 U.S.C. 2534(a) to the procurement of any defense item produced in the UK that is listed below would impede the reciprocal procurement of defense items under the MOU with the UK.

On the basis of the foregoing, the Under Secretary of Defense (Acquisition, Technology, and Logistics) is waiving the limitation in 10 U.S.C. 2534(a) for procurements of any defense item listed below that is produced in the UK. This waiver applies only to the limitations in 10 U.S.C. 2534(a). It does not apply to any other limitation, including section 8018 of the DoD Appropriations Act for Fiscal Year 2009 (Pub. L. 110–329). This waiver applies to procurements under solicitations issued during the period from December 28, 2009, to December 27, 2010 Similar waivers have been granted since 1998, most recently in 2008 (73 FR 73257, December 2, 2008).

List of Items to Which This Waiver Applies

1. Air circuit breakers.
2. Welded shipboard anchor and mooring chain with a diameter of four inches or less.
3. Gyrocompasses.
4. Electronic navigation chart systems.
5. Steering controls.
6. Pumps.
7. Propulsion and machinery control systems.
8. Totally enclosed lifeboats.

Amy G. Williams,

Editor, Defense Acquisition Regulations System.

[FR Doc. E9–29568 Filed 12–10–09; 8:45 am]

BILLING CODE 5001–08–P

the northern section of the Bay where pinniped and cetacean species are more abundant. Based on these previous NEPA analyses and the analysis contained within this notice, NMFS has determined that issuance of a one-year IHA to Caltrans for the taking, by Level B harassment only, incidental to the Antioch Bridge Seismic Retrofit project does not have the potential to result in any significant changes to the human environment. Therefore, the issuance of an IHA to Caltrans for the specified activity falls under the category of those actions which can be categorically excluded from the need to prepare an Environmental Assessment or Environmental Impact Statement.

Dated: December 14, 2009.

Helen M. Golde,

Deputy Director, Office of Protected Resources, National Marine Fisheries Service.

[FR Doc. E9–30179 Filed 12–18–09; 8:45 am]

BILLING CODE 3510–22–S

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Public Hearings for the Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities; Correction

AGENCY: Department of Navy, DoD.

ACTION: Notice; correction.

SUMMARY: The Department of the Navy published a document in the **Federal Register** (74 FR 65761) of December 11, 2009, concerning public hearings on a Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities. The document contained an incorrect date.

FOR FURTHER INFORMATION CONTACT: Naval Facilities Engineering Command Northwest, Attention: Mrs. Amy Burt, Gulf of Alaska Navy Training Activities EIS/OEIS Project Manager, 1101 Tautog Circle, Suite 203, Silverdale, WA 98315–1101; or *http://www.GulfofAlaskaNavyEIS.com.*

Correction

In the **Federal Register** (74 FR 65761) of December 11, 2009, on page 65762, in the first column, correct the fifth paragraph to read:

5. Tuesday, January 12, 2010, at Orca Adventure Lodge Meeting Room & Café, 2500 Orca Road, Cordova, Alaska.

Dated: December 15, 2009.

T. M. Cruz,

Lieutenant Commander, Office of the Judge Advocate General, U.S. Navy, Alternate Federal Register Liaison Officer.

[FR Doc. E9–30318 Filed 12–18–09; 8:45 am]

BILLING CODE 3810–FF–P

DEPARTMENT OF EDUCATION

Notice of Proposed Information Collection Requests

AGENCY: Department of Education.

SUMMARY: The Acting Director, Information Collection Clearance Division, Regulatory Information Management Services, Office of Management, invites comments on the proposed information collection requests as required by the Paperwork Reduction Act of 1995.

DATES: Interested persons are invited to submit comments on or before February 19, 2010.

SUPPLEMENTARY INFORMATION: Section 3506 of the Paperwork Reduction Act of 1995 (44 U.S.C. Chapter 35) requires that the Office of Management and Budget (OMB) provide interested Federal agencies and the public an early opportunity to comment on information collection requests. OMB may amend or waive the requirement for public consultation to the extent that public participation in the approval process would defeat the purpose of the information collection, violate State or Federal law, or substantially interfere with any agency's ability to perform its statutory obligations. The Acting Director, Information Collection Clearance Division, Regulatory Information Management Services, Office of Management, publishes that notice containing proposed information collection requests prior to submission of these requests to OMB. Each proposed information collection, grouped by office, contains the following: (1) Type of review requested, *e.g.* new, revision, extension, existing or reinstatement; (2) Title; (3) Summary of the collection; (4) Description of the need for, and proposed use of, the information; (5) Respondents and frequency of collection; and (6) Reporting and/or Recordkeeping burden. OMB invites public comment.

The Department of Education is especially interested in public comment addressing the following issues: (1) Is this collection necessary to the proper functions of the Department; (2) will this information be processed and used in a timely manner; (3) is the estimate of burden accurate; (4) how might the Department enhance the quality, utility, and clarity of the information to be collected; and (5) how might the Department minimize the burden of this collection on the respondents, including through the use of information technology.

Dated: December 15, 2009.

James Hyler,

Acting Director, Information Collection Clearance Division, Regulatory Information Management Services, Office of Management.

Office of Postsecondary Education

Type of Review: New.

Title: IEPS Fulbright-Hays Group Projects Abroad Customer Surveys.

Frequency: On occasion.

Affected Public: Individuals or households.

Reporting and Recordkeeping Hour Burden:

Responses: 1,829.

Burden Hours: 809.

Abstract: The purpose of this evaluation is to assess the impact of the Group Projects Abroad (GPA) program in enhancing the foreign language capacity of the United States. Three surveys will be conducted: a survey of GPA Project Directors; a survey of 2002–2008 GPA alumni; and a survey of 2009 alumni. Results from the three surveys will inform the writing of a final report determining the impact of the GPA program.

Requests for copies of the proposed information collection request may be accessed from *http://edicsweb.ed.gov*, by selecting the ''Browse Pending Collections'' link and by clicking on link number 4182. When you access the information collection, click on ''Download Attachments'' to view. Written requests for information should be addressed to U.S. Department of Education, 400 Maryland Avenue, SW., LBJ, Washington, DC 20202–4537. Requests may also be electronically mailed to *ICDocketMgr@ed.gov* or faxed to 202–401–0920. Please specify the complete title of the information collection when making your request.

Comments regarding burden and/or the collection activity requirements should be electronically mailed to *ICDocketMgr@ed.gov* 202–401–0526. Individuals who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 1–800–877–8339.

[FR Doc. E9–30276 Filed 12–18–09; 8:45 am]

BILLING CODE 4000–01–P

Appendix B

Cooperating Agency Correspondence

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CORRESPONDENCE TO DR. JAMES W. BALSIGER, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) FISHERIES FROM REAR ADMIRAL RICE (CNO)

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CORRESPONDENCE TO MR. P. MICHAEL PAYNE, NATIONAL MARINE FISHERIES SERVICE (NMFS) FROM OPERATIONAL ENVIRONMENTAL READINESS AND PLANNING BRANCH HEAD RONALD TICKLE (CNO)

CORRESPONDENCE TO MS. AMY BURT, GULF OF ALASKA EIS/OEIS NAVAL FACILITIES ENGINEERING COMMAND, NORTHWEST DIVISION FROM BRANCH CHIEF FRANCES MANN

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DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

5090
Ser N456E/8U158107
31 March 2008

Dr. James W. Balsiger
Assistant Administrator, Acting
National Oceanic and Atmospheric
Administration (NOAA) Fisheries
1315 East West Highway
Silver Spring, MD 20910

Dear Dr. Balsiger:

In accordance with the National Environmental Policy Act (NEPA) and Executive Order 12114, the Department of the Navy (Navy) is preparing an Environmental Impact Statement/ Overseas Environmental Impact Statement (EIS/OEIS) to evaluate potential environmental effects of conducting Navy training in and around the Gulf of Alaska (GOA). In order to adequately evaluate the potential environmental effects of the proposed action, Navy and the National Marine Fisheries Service need to work together on acoustic effects to marine species protected under the Marine Mammal Protection Act (MMPA) and the Endangered Species Act. To assist in this effort and in accordance with 40 CFR Part 1501 and the Council on Environmental Quality Cooperating Agency guidance issued on January 30, 2002, Navy requests NMFS serve as a cooperating agency for the development of the GOA EIS/OEIS.

The No Action Alternative is the continuation of training activities associated with large-scale joint training events in the GOA. Two action alternatives are proposed to accomplish the proposed action. Alternative (1) consists of an increase in the number of training activities from levels described in the No Action Alternative, along with force structure changes associated with the introduction of new weapon systems, vessels, and aircraft into the Fleet. Alternative (2) consists of all elements of Alternative (1) plus the addition of a second summertime carrier strike group exercise in the GOA each year.

The purpose of the proposed action is to:

- Support U.S. Pacific Command (PACOM) and U.S. Northern Command (NORTHCOM) training requirements;

- Achieve and maintain Fleet readiness using the GOA to support and conduct current, emerging, and future training activities;
- Accommodate new training requirements associated with the introduction of new weapons and systems to the Fleet; and
- Support civilian authorities in homeland defense training exercises.

The EIS/OEIS will address reasonably foreseeable activities in the particular geographical areas affected by the No Action Alternative and action alternatives. This EIS/OEIS will analyze the effects of sound in the water on marine mammals in the areas of the GOA where activities occur. In addition, other environmental resource areas that will be addressed as applicable in the EIS/OEIS include, but are not limited to: air quality; airspace; biological resources, including threatened and endangered species; cultural resources; geology and soils; hazardous materials and waste; health and safety; noise; socioeconomics; transportation; and water resources.

As the lead agency, the Navy will be responsible for preparing the EIS/OEIS which includes, but is not limited to the following:

- Gathering all necessary background information and preparing the EIS/OEIS and all necessary permit applications associated with acoustic issues on the GOA study area.
- Working with NMFS personnel to determine the method of estimating potential effects to protected marine species, including threatened and endangered species.
- Determining the scope of the EIS/OEIS, including the alternatives evaluated.
- Circulating the appropriate NEPA documentation to the general public and any other interested parties.
- Scheduling and supervising meetings held in support of the NEPA process and compiling any comments received.
- Maintaining an administrative record and responding to any Freedom of Information Act requests relating to the EIS/OEIS.

As a cooperating agency, the Navy requests NMFS support the Navy in the following manner:

- Providing timely comments after the Agency Information Meeting (which will be held at the onset of the EIS/OEIS process) and on working drafts of the EIS/OEIS documents. The Navy requests that comments on draft EIS/OEIS documents be provided within 30 calendar days.

- Responding to Navy requests for information in a timely manner.

- Coordinating, to the maximum extent practicable, any public comment periods that are necessary in the MMPA permitting process with the Navy's NEPA public comment periods.

- Participating, as necessary, in meetings hosted by the Navy for discussion of EIS/OEIS-related issues.

- Adhering to the overall schedule as set forth by the Navy.

- Providing a formal, written response to this request.

The Navy views this agreement as important to the successful completion of the NEPA process for the GOA EIS/OEIS. It is the Navy's goal to complete the analysis as expeditiously as possible, while using best scientific information available. NOAA Fisheries assistance will be invaluable in that endeavor.

My point of contact for this action is Ms. Karen M. Foskey, (703) 602-2859, email: Karen.Foskey@navy.mil.

Sincerely,

L. RICE
Read Admiral, U.S. Navy
Director, Environmental Readiness
Division (OPNAV N45)

Copy to:
Deputy Assistant Secretary of the Navy (Environment)
Office of Assistant General Counsel (Installation & Environment)

Commander, U.S. Pacific Fleet (N01CE, N7)
Commander, U.S. Fleet Forces Command (N73, N77)
Commander, Naval Installations Command (N45)
Commander, Navy Region Northwest (N40)
Commander, Naval Facilities Engineering Command, Northwest (N45)

DEPARTMENT OF THE NAVY
COMMANDER
UNITED STATES PACIFIC FLEET
250 MAKALAPA DRIVE
PEARL HARBOR. HAWAII 96860-3131

IN REPLY REFER TO:
5090
Ser N01CE1/0379
4 Apr 08

Mr. Tom Melius
Regional Director
U.S. Fish & Wildlife Service – Alaska Region
1011 East Tudor Road
Anchorage, Alaska 99503

Dear Mr. Melius:

SUBJECT: GULF OF ALASKA ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT FOR NAVY TRAINING ACTIVITIES

In accordance with the Council on Environmental Quality regulations implementing the National Environmental Policy Act, the Department of the Navy (Navy) requests that the U.S. Fish & Wildlife Service serve as a cooperating agency for the development of the Gulf of Alaska (GOA) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS).

This EIS/OEIS will evaluate several alternatives based on intensity and frequency of training within an identified geographic area.

The proposed action will allow the Navy to:

- Maintain baseline training activities at current levels;
- Increase training activities from current levels to support future Fleet exercise requirements;
- Accommodate new training requirements associated with the introduction of new weapons and systems to the Fleet; and
- Support civilian authorities in homeland defense training exercises.

The EIS/OEIS will address reasonably foreseeable activities in the particular geographical areas affected by the alternatives and analyze the potential effects of additional training activities. Areas of analysis will the potential effects of sound in the water on marine mammals in the areas of

the GOA where training activities occur. Other environmental resource areas that will be addressed include, but are not limited to: air quality; airspace; biological resources, including threatened and endangered species; historic and cultural resources; water resources; geology; hazardous materials and waste; health and safety; noise; socioeconomics; transportation; fishing; and recreation.

As the lead agency, the Navy will prepare the EIS/OEIS that includes but is not limited to the following:

- Gathering all necessary background information and preparing the EIS/OEIS.

  Working with U.S. Fish & Wildlife Service personnel to evaluate potential impacts of changes and enhancements on wildlife refuges, critical habitat, and wildlife resources including threatened and endangered species.

- Identifying the scope of the EIS/OEIS, including the alternatives evaluated.

- Circulating the appropriate NEPA documentation to the general public and any other interested parties.

- Scheduling and supervising meetings held in support of the NEPA process, and compiling any comments received.

- Maintaining an administrative record and responding to any Freedom of Information Act requests relating to the EIS/OEIS.

As a cooperating agency, the Navy requests the U.S. Fish & Wildlife Service support the Navy by:

Providing timely comments throughout the EIS process, to include, on working drafts of the EIS/OEIS documents. The Navy requests that comments on draft EIS/OEIS documents be provided within 30 calendar days.

- Responding to Navy requests for information. Timely U.S. Fish & Wildlife Service input will be critical to meeting our planned schedule.

- Participating, as necessary, in meetings hosted by the Navy for discussion of EIS/OEIS related issues including the preparation of the draft EIS/OEIS and responses to comments.

- Adhering to the overall schedule as set forth by the Navy.

The Navy views your participation as a cooperating agency important to the successful completion of the NEPA process for the Gulf of Alaska EIS/OEIS. It is the Navy's goal to complete the analysis as expeditiously as possible, while using best scientific information available. USFWS assistance will be invaluable in that endeavor.

Navy's timelines for the completion of this EIS/OEIS are aggressive. The schedule calls for the draft EIS/OEIS and public Hearings in Mid 2009, release of the final EIS/OEIS in early 2010 and a record of decision in Mid 2010.

My point of contact for this action is Ms. Carolyn L. Winters, (360) 315-5092, email: carolyn.winters@navy.mil.

Sincerely,



J. P. RIOS
Captain, U.S. Navy
Deputy Fleet Civil Engineer
By direction

Copy to:
Chief of Naval Operations (N45)
Commander, U.S. Fleet Forces Command (N73, N77)
Commander, U.S. Pacific Fleet (N7)
Commander, Naval Installations Command (N45)
Commander, Navy Region Northwest (N4, N40)
Commander, Naval Facilities Engineering Command, Northwest (EV1)

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

5090
Ser N456M/8U158134
21 April 2008

Mr. P. Michael Payne
Division Chief
Permits, Conservation, and Education Division
National Marine Fisheries Service (NMFS)
National Oceanic and Atmospheric Administration
B-SSMC3, Room 13821
1315 East-West Highway
Silver Springs, MD 20910

Dear Mr. Payne:

The Commander, U.S. Pacific Fleet (CPF) is preparing an Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) to assess the potential environmental impacts associated with Navy training in the Gulf of Alaska (GOA). Specifically, the Proposed Action is to continue and increase training activities in the GOA. A collection of actions will be evaluated within the EIS/OEIS.

The No Action Alternative is the continuation of training activities associated with large-scale Joint training events in the GOA. Two action alternatives are proposed to accomplish the Proposed Action. Alternative 1 consists of an increase in the number of training activities from levels described in the No Action Alternative, along with force structure changes associated with the introduction of new weapon systems, vessels, and aircraft into the Fleet. Alternative 2 consists of all elements of Alternative 1 plus the addition of a second summertime carrier strike group exercise in the GOA each year.

The purpose of the Proposed Action is to:

- Support U.S. Pacific Command (PACOM) and U.S. Northern Command (NORTHCOM) training requirements;

  Support Joint Task Force 519 (JTF-519) training requirements;

- Achieve and maintain Fleet readiness using the GOA to support and conduct current, emerging, and future training activities;

  Accommodate new training requirements associated with the introduction of new weapons and systems to the Fleet; and

- Support civilian authorities in homeland defense training exercises.

More specific descriptions of the alternatives are included in enclosure (1).

Conduct of these activities will likely result in acoustic exposure of marine mammals listed under the Marine Mammal Protection Act (MMPA) from mid-frequency active sonar (MFAS) and impulsive sources, and likely requires a Letter of Authorization (LOA). As such, the Navy will be submitting an LOA request to your office in the coming months for these activities. It is expected that species for which an LOA is sought will include species listed under the Endangered Species Act.

As applicant for a Letter of Authorization, the Navy requests your office initiate early consultation procedures with the Endangered Species Division, in accordance with Section 7(a)(3) of the Endangered Species Act and its implementing regulation at 50 CFR §402.11. In accordance with these regulations, the attached Preliminary Draft Description of the Proposed Action and Alternatives for the GOA Navy Training Activities EIS/OEIS serves as the Navy's definitive proposal outlining the action (Enclosure 1). As previously stated, the effects of the proposed action for purposes of the MMPA permit will be from exposure to acoustic energy from MFAS and impulsive sources. The level of magnitude of these effects is still being modeled, and will be included in the Navy's request for an LOA.

Title 10, Section 5062 of the United States Code requires the Navy to be "organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea." The current and emerging training activities in the GOA will be used to meet this legal requirement. Thus, in accordance with 50 CFR §402.11(b), this letter serves as the Navy's statement that it intends to implement the proposal should an MMPA Letter of Authorization be obtained from your office.

We appreciate your continued support in helping us to meet our Section 7 responsibilities. My point of contact for this matter is Ms. Elizabeth Phelps, 703-604-5420 or Elizabeth.Phelps@navy.mil.

Sincerely,

R. E. Tickle

Ronald Tickle
Head, Operational Environmental
Readiness and Planning Branch
Environmental Readiness Division
(OPNAV N45)

Enclosure:
(1) DRAFT - Gulf of Alaska Navy Training Activities EIS/OEIS Description of Proposed Action and Alternatives (Dated March 2008)

Copy to:
Chief of Naval Operations (N43)
Commander, U.S. Fleet Forces Command (N73, N77)
Commander, U.S. Pacific Fleet (N01CE, N3, N7)
Commander, Naval Installations Command (N45)
Commander, Navy Region Northwest (N40)
Commander, Naval Facilities Engineering Command, Northwest (N45)

From:	Frances_Mann@fws.gov
To:	Burt, Amy E CIV NAVFAC NW, EV1;
cc:	Ann_Rappoport@fws.gov; Frances_Mann@fws.gov;
Subject:	FWS declines to be cooperators on EIS for Gulf of Alaska
Date:	Monday, September 08, 2008 16:21:55

Dear Ms. Burt:

Thank you for your April 4, 2008, request for the U.S. Fish and Wildlife Service to be a cooperating agency in your preparation of an Environmental Impact Statement (EIS) for navy training exercises in the Gulf of Alaska. I regret that we must decline this opportunity due to staffing and timing constraints of other Service priorities. Nevertheless, we are concerned about potential effects of the proposed activities on Service trust resources in this area and surrounding areas where there could be secondary and indirect effects. Consequently we expect to maintain our status as a commenting agency throughout your National Environmental Policy Act process for this potential action. In that regard, we will involve pertinent Service programs and expect to work with your staff as the EIS is developed.

For further coordination and comments on this project, please contact Ann Rappoport or me (contact information provide below).

Thank you.

Frances

Ann Rappoport, Field Supervisor
907-271-2787
Ann_rappoport@fws.gov <mailto:Ann_rappoport@fws.gov>

Frances Mann, Branch Chief, Conservation Planning Assistance
907-271-3053
Frances_mann@fws.gov <mailto:Frances_mann@fws.gov>

Address for both Ann and Fran:

Anchorage Fish and Wildlife Field Office
605 W. 4th Ave., Rm. G61
Anchorage, AK 99501

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Appendix C

Regulatory Consultations

APPENDIX C
AGENCY CONSULTATION

The Navy has consulted with regulatory agencies as appropriate during the National Environmental Policy Act process and prior to implementation of the Proposed Action to ensure requirements have been met. The following is a list of the Gulf of Alaska (GOA) regulatory agency consultation documentation. Agency correspondence and supporting documentation can be found on the GOA Environmental Impact Statement (EIS) website at www.gulfofalaskanavyeis.com.

U.S. Fish and Wildlife Service, Alaska Region, Endangered Species Act

- U.S. Navy, February 2010. Gulf of Alaska Navy Training Activities Biological Evaluation.
- U.S. Fish and Wildlife, March 24, 2010. Concurrence Letter, Gulf of Alaska Navy Training Activities (Consultation #2010-0075).

National Oceanic and Atmospheric Administration - National Marine Fisheries Service, Headquarters, Endangered Species Act

- U.S. Navy, April 2008. Request for Endangered Species Act Section 7 consultation.
- U.S. Navy, March 2010. Request for formal Endangered Species Act Section 7 consultation.

National Oceanic and Atmospheric Administration - National Marine Fisheries Service, Headquarters, Marine Mammal Protection Act

- U.S. Navy, March 2009. Request for five-year Letter of Authorization.
- U.S. Navy, August 2009. Request for review of working draft of Environmental Impact Statement (Draft EIS Version 3).
- U.S. Navy, November 2009. Revised request for five-year Letter of Authorization
- National Marine Fisheries Service, February 3, 2010. Taking and Importing Marine Mammals; Navy Training Activities Conducted in the Gulf of Alaska; Notice of receipt of application for letter of authorization. Published in the Federal Register (75 FR 5575 - 5576).
- National Marine Fisheries Service, October 19, 2010. Taking and Importing Marine Mammals; Military Training Activities Conducted Within the Gulf of Alaska (GoA) Temporary Maritime Activities Area (TMAA); Proposed Rule. Published in the Federal Register (75 FR 64508 - 64583).

National Oceanic and Atmospheric Administration - National Marine Fisheries Service, Magnuson-Stevens Fishery Conservation and Management Act

- U.S. Navy, August 2010. Gulf of Alaska (GOA) Navy Training Activities Essential Fish Habitat Assessment.
- National Marine Fisheries Service, January 4, 2011. Essential Fish Habitat Assessment consultation letter.
- U.S. Navy, January 24, 2011. Essential Fish Habitat Assessment consultation response letter.

Alaska Department of Natural Resources, Alaska Coastal Management Program, Coastal Zone Management Act

- U.S. Navy, June 2009. Request for Agency Preliminary Review of GoA Navy Training Activities EIS/OEIS for Alaska Coastal Management Program Applicability and Enforceable Policy Guidance.
- Alaska Department of Natural Resources, Alaska Coastal Management Program, August 27, 2009. Agency preliminary review response letter.
- U.S. Navy, July 2010. Coastal Zone Management Act *de minimis* statement letter.
- Alaska Department of Natural Resources, Alaska Coastal Management Program, October 14, 2010. De Minimis Consistency Response-Agreement.

Alaska Department of Natural Resources, Office of History and Archaeology, State Historic Preservation Office, National Historic Preservation Act, Section 106

- U.S. Navy, April 2010. National Historic Preservation Act Section 106 Determination for Gulf of Alaska Navy Training Activities.
- Alaska Department of Natural Resources, Office of History and Archaeology, State Historic Preservation Office, May 2010. Notice of No Historic Properties Affected.

Government to Government Consultation

- Department of Defense, March 2008. Kaguyak Tribal Council Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Defense, April 2008. Yakutat Tlingit Tribal Council Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Native Village of Port Lions, June 9, 2008. Letter of No Concerns.
- Department of Navy, June 2008. Internal Memo with Status of Response of Tribes to GOA EIS letters.
- Department of Navy, December 2009. Native Village of Afognak Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Native Village of Chenega Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Native Village of Eyak Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Kaguyak Village Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Lesnoi Village Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Native Village of Old Harbor Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Native Village of Ouzinkie Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Native Village of Port Graham Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Native Village of Port Lions Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Shoonaq' Tribe of Kodiak Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Native Village of Tatitlek Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Department of Navy, December 2009. Yakutat Tlingit Tribe Notification Letter of anticipated U.S. Navy training activities in the Gulf of Alaska.
- Native Village of Afognak, January 22, 2010. Native Village of Afognak Response Letter.
- Native Village of Eyak, January 22, 2010. Native Village of Eyak Response Letter

Federal Aviation Administration (FAA) Correspondence

- U.S. Navy, May 2009. OPNAV Recommendation ICO Navy Training Activities in the Gulf of Alaska letter.

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D MARINE MAMMAL MODELING

D.1 BACKGROUND AND OVERVIEW

All marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the unauthorized take of marine mammals in U.S. waters and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the U.S.

The Endangered Species Act of 1973 (ESA) provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of their ecosystems. A "species" is considered endangered if it is in danger of extinction throughout all or a significant portion of its range. A species is considered threatened if it is likely to become an endangered species within the foreseeable future. There are marine mammals, already protected under MMPA, listed as either endangered or threatened under ESA, and afforded special protections.

Actions involving sound in the water include the potential to harass marine animals in the surrounding waters. Demonstration of compliance with MMPA and the ESA, using best available science, has been assessed using criteria and thresholds accepted or negotiated, and described here.

Sections of the MMPA (16 United States Code [U.S.C.] 1361 et seq.) direct the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of small numbers of marine mammals by U.S. citizens who engage in a specified activity, other than commercial fishing, within a specified geographical region.

Authorization for incidental takings may be granted if the National Marine Fisheries Service (NMFS) finds that the taking will have no more than a negligible impact on the species or stock(s), will not have an immitigable adverse impact on the availability of the species or stock(s) for subsistence uses, and that the permissible methods of taking, and requirements pertaining to the mitigation, monitoring and reporting of such taking are set forth.

NMFS has defined negligible impact in 50 Code of Federal Regulations (CFR) 216.103 as an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival.

Subsection 101(a)(5)(D) of the MMPA established an expedited process by which citizens of the United States can apply for an authorization to incidentally take small numbers of marine mammals by harassment. The National Defense Authorization Act of 2004 (NDAA) (Public Law 108-136) removed the small numbers limitation and amended the definition of "harassment" as it applies to a military readiness activity to read as follows:

> (i) *any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A Harassment]; or*
>
> (ii) *any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [Level B Harassment]*.

The primary potential impact to marine mammals from underwater acoustics is Level B harassment from exposure to various sources of sound in the water including sonar and explosives. The criteria for modeling impacts from these sources are detailed in the following sections.

D.1.1 Acoustic Sound Sources

The amount of Threshold Shift depends on the amplitude, duration, frequency, and temporal pattern of the sound exposure. Threshold shifts will generally increase with the amplitude and duration of sound exposure. For continuous sounds, exposures of equal energy will lead to approximately equal effects (Ward 1997). For intermittent sounds, less Threshold Shift will occur than from a continuous exposure with the same energy (some recovery will occur between exposures) (Kryter et al., 1966; Ward 1997). The magnitude of Threshold Shift normally decreases with the amount of time post-exposure (Miller 1974).

Permanent Threshold Shift (PTS) is non-recoverable and results from the destruction of tissues within the auditory system. PTS therefore qualifies as an injury and is classified as Level A harassment under the MMPA. The smallest amount of PTS (onset- PTS) is taken to be the indicator for the smallest degree of injury that can be measured. The acoustic exposure associated with onset-PTS is used to define the outer limit of the Level A exposure zone.

If the TS eventually returns to zero (the threshold returns to the pre-exposure value), the TS is a Temporary Threshold Shift (TTS). TTS is, from recent rulings (NOAA 2001; 2002a), considered to result from the temporary, non-injurious distortion of hearing-related tissues. The smallest measurable amount of TTS (onset-TTS) is taken as the best indicator for slight temporary sensory impairment. Because it is considered non-injurious, the acoustic exposure associated with onset-TTS is used to define the outer limit of the portion of the Level B exposure zone attributable to physiological effects. This follows from the concept that hearing loss potentially affects an animal's ability to react normally to the sounds around it. Therefore, the potential for TTS is considered as Level B harassment caused by physiological effects on the auditory system.

The exposure threshold established for onset-TTS is 195 dB re $1\mu Pa^2$-s. This result is supported by the short-duration tone data of Finneran et al. (2002, 2005) and the long-duration sound data from Nachtigall et al., (2003). Together, these data demonstrate that TTS in small odontocetes is correlated with the received EL and that onset-TTS exposures are fit well by an equal-energy line passing through 195 dB re $1\mu Pa^2$-s. Absent any additional data for other species and being that it is likely that small odontocetes are more sensitive to the mid-frequency active/high-frequency active frequency levels of concern, this threshold is used for analysis for all cetacea.

The PTS thresholds established for use in this analysis are based on a 20 dB increase in exposure EL over that required for onset-TTS. The 20 dB value is based on estimates from terrestrial mammal data of PTS occurring at 40 dB or more of TS, and on TS growth occurring at a rate of 1.6 dB/dB increase in exposure EL. This is conservative because: (1) 40 dB of TS is actually an upper limit for TTS used to approximate onset-PTS, and (2) the 1.6 dB/dB growth rate is the highest observed in the data from Ward et al. (1958, 1959). Using this estimation method (20 dB increase from onset-TTS) for analysis, the PTS threshold for cetacea is 215 dB re $1\mu Pa^2$-s.

Unlike cetaceans, the TTS and PTS thresholds used for pinnipeds vary with species. Otariids have thresholds of 206 dB re $1\mu Pa^2$-s for TTS and 226 dB re $1\mu Pa^2$-s for PTS. Northern elephant seals are similar to otariids (TTS = 204 dB re $1\mu Pa^2$-s, PTS = 224 dB re $1\mu Pa^2$-s) but are lower for harbor seals (TTS = 183 dB re $1\mu Pa^2$-s, PTS = 203 dB re $1\mu Pa^2$-s). A certain proportion of marine mammals is expected to experience behavioral disturbance at different received sound pressure levels and are counted as Level B harassment takes. The details of this theory and calculation are described in the Risk Function section. Table D-1 summarizes the threshold levels for analysis of non-explosive sound sources used during Navy training activities in the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA).

Table D-1 - Non-Explosive Sound Source Threshold Levels

Physiological Effects			
Animal	**Criteria**	**Threshold (re 1µPa^2-s)**	**MMPA Effect**
Cetacean	TTS PTS	195 215	Level B Harassment Level A Harassment
Pinnipeds			
Northern Elephant Seal	TTS PTS	204 224	Level B Harassment Level A Harassment
Steller Sea Lion	TTS PTS	206 226	Level B Harassment Level A Harassment
Northern Fur Seal	TTS PTS	206 226	Level B Harassment Level A Harassment

D.1.2 Explosives

For underwater explosions resulting from use of live ordnance in the TMAA, in the absence of any mitigation or monitoring measures, there is a very small chance that a marine mammal could be injured or killed when exposed to the energy generated from an explosive force. Analysis of sound and pressure impacts from underwater explosions is based on criteria and thresholds initially presented in U.S. Navy Environmental Impact Statements for ship shock trials of the Seawolf submarine and the Winston Churchill (DDG 81), and subsequently adopted by NMFS.

Non-lethal injurious impacts (Level A Harassment) are defined in those documents as tympanic membrane (TM) rupture and the onset of slight lung injury. The threshold for Level A Harassment corresponds to a 50-percent rate of TM rupture, which can be stated in terms of an energy flux density (EFD) value of 205 dB re 1µPa^2-s. TM rupture is well-correlated with permanent hearing impairment. Ketten (1998) indicates a 30-percent incidence of permanent threshold shift (PTS) at the same threshold.

The criteria for onset of slight lung injury were established using partial impulse because the impulse of an underwater blast wave was the parameter that governed damage during a study using mammals, not peak pressure or energy (Yelverton, 1981). Goertner (1982) determined a way to calculate impulse values for injury at greater depths, known as the Goertner "modified" impulse pressure. Those values are valid only near the surface because as hydrostatic pressure increases with depth, organs like the lung, filled with air, compress. Therefore the "modified" impulse pressure thresholds vary from the shallow depth starting point as a function of depth.

The shallow depth starting points for calculation of the "modified" impulse pressures are mass-dependent values derived from empirical data for underwater blast injury (Yelverton, 1981). During the calculations, the lowest impulse and body mass for which slight, and then extensive, lung injury found during a previous study (Yelverton et al, 1973) were used to determine the positive impulse that may cause lung injury. The Goertner model is sensitive to mammal weight such that smaller masses have lower thresholds for positive impulse so injury and harassment will be predicted at greater distances from the source for them. Impulse thresholds of 13.0 and 31.0 psi-msec, found to cause slight and extensive injury in a dolphin calf, were used as thresholds in the analysis contained in this document.

Level B (behavior response) Harassment includes temporary (auditory) threshold shift (TTS), a slight, recoverable loss of hearing sensitivity. One criterion used for TTS, the total energy flux density of the sound, is a threshold of 182 dB re 1µPa^2-s maximum EFD level in any 1/3-octave band above 100 Hz for toothed whales (e.g., dolphins). A second criterion, a maximum allowable peak pressure of 23 psi, has recently been established by NMFS to provide a more conservative range for TTS when the explosive or animal approaches the sea surface, in which case explosive energy is reduced, but the peak pressure is not. NMFS applies the more conservative of these two.

For multiple successive explosions (MSE) occurring underwater, the acoustic criterion for non-TTS behavioral disturbance is used to account for behavioral effects significant enough to be judged as harassment, but occurring at lower sound energy levels than those that may cause TTS. The non-TTS threshold is derived following the approach of the Churchill Final Environmental Impact Statement (FEIS) for the energy-based TTS threshold. The research on pure-tone exposures reported in Schlundt et al. (2000) and Finneran and Schlundt (2004) provided a threshold of 192 dB re 1µPa^2-s as the lowest TTS value. This value for pure-tone exposures is modified for explosives by (a) interpreting it as an energy metric, (b) reducing it by 10 dB to account for the time constant of the mammal ear, and (c) measuring the energy in 1/3 octave bands, the natural filter band of the ear. The resulting TTS threshold for explosives is 182 dB re 1µPa^2-s in any 1/3 octave band. As reported by Schlundt et al. (2000) and Finneran and Schlundt (2004), instances of altered behavior in the pure-tone research generally began five dB lower than those causing TTS. The non-TTS threshold is therefore derived by subtracting 5 dB from the 182 dB re 1µPa^2-s in any 1/3 octave band threshold, resulting in a 177 dB re 1µPa^2-s (EL) sub-TTS behavioral disturbance threshold for MSE. Table D-2 summarizes the threshold levels for analysis of explosives used in the GOA.

Table D-2 - Explosives Threshold Levels

Threshold Type	Threshold Level
Level A – 50% Eardrum rupture	205 dB re 1µPa^2-s
Temporary Threshold Shift (TTS) (peak 1/3 octave energy)	182 dB re 1µPa^2-s
Sub-TTS Threshold for Multiple Successive Explosions (peak 1/3 octave energy)	177 dB re 1µPa^2-s
Temporary Threshold Shift (TTS) (peak pressure)	23 psi
Level A – Slight lung injury (positive impulse)	13 psi-ms
Fatality – 1% Mortal lung injury (positive impulse)	31 psi-ms

The sound sources will be located in an area that is inhabited by species listed as threatened or endangered under the ESA (16 USC §§ 1531-1543). Operation of the sound sources, that is, transmission of acoustic signals in the water column, could potentially cause harm or harassment to listed species.

"Harm" defined under ESA regulations is "…an act which actually kills or injures…" (50 CFR 222.102) listed species. "Harassment" is an "intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3).

If a federal agency determines that its proposed action "may affect" a listed species, it is required to consult, either formally or informally, with the appropriate regulator. There is no permit issuance under ESA, rather consultation among the cognizant federal agencies under Section 7 of the ESA. Such consultations would likely be concluded favorably, subject to requirements that the activity will not appreciably reduce the likelihood of the species' survival and recovery and impacts are minimized and mitigated.

D.2 ACOUSTIC SOURCES

The acoustic sources employed in the TMAA are categorized as either broadband (producing sound over a wide frequency band) or narrowband (producing sound over a frequency band that that is small in comparison to the center frequency). In general, the majority of acoustic energy results from narrowband sonars utilized for Anti-Submarine Warfare (ASW) activities and underwater explosions as broadband sources. This delineation of source types has a couple of implications. First, the transmission loss used to determine the impact ranges of narrowband ASW sonars can be adequately characterized by model estimates at a single frequency. Broadband explosives, on the other hand, produce significant acoustic energy across several frequency decades of bandwidth. Propagation loss is sufficiently sensitive to frequency as to require model estimates at several frequencies over such a wide band.

Second, the types of sources have different sets of harassment metrics and thresholds. Energy metrics are defined for both types. However, explosives are impulsive sources that produce a shock wave that dictates additional pressure-related metrics (peak pressure and positive impulse). Detailed descriptions of both types of sources are provided in the following subsections.

D.2.1 Acoustic Sources

Operations in the TMAA involve four (4) types of narrowband sonars, as shown in Table D-3. Harassment estimates are calculated for each source according to the manner in which it operates. For example, the SQS-53 is a hull-mounted, surface ship sonar that operates for many hours at a time, so it is useful to calculate and report SQS-53 harassments per hour of operation. The AQS-22 is a helicopter-deployed sonar, which is lowered into the water, pings a number of times, and then moves to a new location. For the AQS-22, it is useful to calculate and report harassments per dip. The SSQ-62 sonobuoy is modeled at a single depth pinging for a fixed duration, so harassments are accordingly reported per sonobuoy deployed. The following table presents the deploying platform, frequency class, and the reporting metric for each acoustic source analyzed for use in the TMAA.

Table D-3 - Acoustic Sources Analyzed for use in the TMAA

Sonar	Description	Frequency Class	Harassments Reported
SQS-53	Surface ship sonar	Mid-frequency	Per hour
SSQ-62	Sonobuoy sonar	Mid-frequency	Per sonobuoy
AQS-22	Helicopter-dipping sonar	Mid-frequency	Per dip
SQS-56	Surface ship sonar	Mid-frequency	Per hour
MK-84 Range Pingers	Surface pingers	High-frequency	Per day
PUTR Transponders	Bottom pingers	Mid-frequency	Per day
MK-39 EMATT	Training target	Low frequency	Per hour
BQQ-10	Submarine sonar	Classified	Per hour
BQS-15	Submarine sonar	Classified	Per hour
SUS, MK-84	Expendable buoy	Mid-frequency	Per hour

The acoustic modeling that is necessary to support the harassment estimates for each of these sonars relies upon a generalized description of the manner of the sonar's operating modes. This description includes the following:

- "Effective" energy source level—This is the level relative to $1\mu Pa^2$-s of the integral over frequency and time of the square of the pressure and is given by the total energy level across the band of the source, scaled by the pulse length ($10 \log_{10}$ [pulse length]).

- Source depth—Depth of the source in meters.
- Nominal frequency - Typically the center band of the source emission. These are frequencies that have been reported in open literature and are used to avoid classification issues. Differences between these nominal values and actual source frequencies are small enough to be of little consequence to the output impact volumes.
- Source directivity - The source beam is modeled as the product of a horizontal beam pattern and a vertical beam pattern. Two parameters define the horizontal beam pattern:
    - Horizontal beam width—Width of the source beam (degrees) in the horizontal plane (assumed constant for all horizontal steer directions).
    - Horizontal steer direction—Direction in the horizontal in which the beam is steered relative to the direction in which the platform is heading.

  The horizontal beam is assumed to have constant level across the width of the beam with flat, 20-dB down side lobes at all other angles.

  Similarly, two parameters define the vertical beam pattern:

    - Vertical beam width - Width of the source beam (degrees) in the vertical plane measured at the 3-dB down point (assumed constant for all vertical steer directions).
    - Vertical steer direction - Direction in the vertical plane that the beam is steered relative to the horizontal (upward looking angles are positive).

  To avoid sharp transitions that a rectangular beam might introduce, the power response at vertical angle θ is

$$\text{Power} = \max \{ \sin^2 [n(\theta_s - \theta)] / [n \sin (\theta_s - \theta)]^2,\ 0.01 \},$$

  where θ_s is the vertical beam steer direction, and $n = 2*L/\lambda$ (L = array length, λ = wavelength).

  The beamwidth of a line source is determined by n (the length of the array in half-wavelengths) as $\theta_w = 180^o/n$.

- Ping spacing - Distance between pings. For most sources this is generally just the product of the speed of advance of the platform and the repetition rate of the sonar. Animal motion is generally of no consequence as long as the source motion is greater than the speed of the animal (nominally, 3 knots). For stationary (or nearly stationary) sources, the "average" speed of the animal is used in place of the platform speed. The attendant assumption is that the animals are all moving in the same constant direction.

These parameters are defined for each of the active sound sources in Table D-4 and D-5.

Table D-4 – Source Description of Active Sources used in the TMAA

Sonar	Source Depth	Center Freq	Source Level	Emission Spacing	Vertical Directivity	Horizontal Directivity
SQS-53C	7 m	3.5 kHz	235 dB	154 m	Omni	240° Forward-looking
SSQ-62	27 m	8 kHz	201 dB	450 m	Omni	Omni
AQS-22	27 m	4.1 kHz	217 dB	15 m	Omni	Omni
SQS-56	7 m	7.5 kHz	225 dB	129 m	Omni	90° Forward-looking
MK-84 Range Pingers	7m, 100m	12.9 kHz	194 dB		90 Down	Omni
PUTR Transponders	1,800 m	8.8 kHz	186 dB	Variable	180 Upward	Omni
MK-39 EMATT	100 m	900 Hz	130 dB	Continuous	Omni	Omni
BQQ-10	100 m	Classified	Classified	Classified	Classified	Classified
BQS-15	50 m	Classified	Classified	Classified	Classified	Classified
SUS, MK-84	50 m	3.4 kHz	160 dB	Continuous	Omni	Omni

The following are the usage units for sonar sources in the TMAA (all modeled during the summer season):

Table D-5 – Sonar Usage Units

Sonar	2CSG	1CSG
SQS-53C	578 Hours	289 hours
SSQ-62	267 buoys	133 buoys
AQS-22	192 dips	96 dips
SQS-56	52 hours	26 hours
BQQ-10	48 hours	24 hours
BQS-15	24 hours	12 hours

D.2.2 Explosives

Explosives detonated underwater introduce loud, impulsive, broadband sounds into the marine environment. Three source parameters influence the effect of an explosive: the weight of the explosive material, the type of explosive material, and the detonation depth. The net explosive weight (or NEW) accounts for the first two parameters. The NEW of an explosive is the weight of TNT required to produce an equivalent explosive power.

The detonation depth of an explosive is particularly important due to a propagation effect known as surface-image interference. For sources located near the sea surface, a distinct interference pattern arises from the coherent sum of the two paths that differ only by a single reflection from the pressure-release surface. As the source depth and/or the source frequency decreases, these two paths increasingly, destructively interfere with each other, reaching total cancellation at the surface (barring surface-reflection scattering loss).

For the TMAA, explosive sources having detonations in the water include the following: SSQ-110 EER sonobuoys and MK-82, MK-83, MK-84, BDU-45 bombs, 5” rounds and 76 mm gunnery rounds, MK-48 torpedo, and Maverick missile. The SSQ-110 source can be detonated at several depths within the water column. For this analysis, a relatively shallow depth of 65 ft (20 m) is used to optimize the likelihood of

the source being positioned in a surface duct. A source depth of two meters is used for bombs and missiles that do not strike their target. The MK-48 torpedo detonates immediately below the target's hull and a nominal depth of 50 ft (14 m) is used as its source depth in this analysis. For the gunnery rounds, a source depth of one foot is used. The NEW modeled for these sources are as follows:

- SSQ-110 Sonobuoy - 5 pounds
- MK-82 bomb - 238 pounds
- MK-83 bomb - 238 pounds
- MK-83 bomb – 574 pounds
- MK-84 bomb – 945 pounds
- 5" rounds – 9.54 pounds
- 76 mm rounds – 1.6 pounds
- MK-48 torpedo – 851 pounds
- Air-to-Ground (AGM)-65 Maverick Missile – 78.5 pounds

The harassments expected to result from these sources are computed on a per in-water explosive basis. The cumulative effect of a series of explosives can often be derived by simple addition if the detonations are spaced widely in time or space, allowing for sufficient animal movements as to ensure a different population of animals is considered for each detonation.

The cases in which simple addition of the harassment estimates may not be appropriate are addressed by the modeling of a "representative" sinking exercise (SINKEX). In a SINKEX, a decommissioned vessel is towed to a specified deep-water location and there used as a target for a variety of weapons. Although no two SINKEXs are ever the same, a representative case derived from past exercises is described in the Programmatic SINKEX Overseas Environmental Assessment (March 2006) for the Western North Atlantic. Unguided weapons are more frequently off-target and are modeled according to the statistical hit/miss ratios. Note that these hit/miss ratios are artificially low in order to demonstrate a worst-case scenario; they should not be taken as indicative of weapon or platform reliability. With one exception, it is assumed that all missiles in a SINKEX will strike the target vessel. The Maverick missile and bombs used in SINKEX were modeled as missing the target vessel approximately 33 percent of the time. For all live rounds fired in a GUNEX and an estimated 32 percent of rounds fired in SINKEX may explode in the water.

In a SINKEX, weapons are typically fired in order of decreasing range from the source with weapons fired until the target is sunk. A torpedo is used after all munitions have been expended if the target is still afloat. Since the target may sink at any time during the exercise, the actual number of weapons used can vary widely. In the representative case, however, all of the ordnances are assumed expended; this represents the worst case with maximum exposure.

The sequence of weapons firing for the representative SINKEX is described in Table D-6. Guided weapons are nearly 100% accurate and are modeled as hitting the target (that is, no underwater acoustic effect) in all but two cases: (1) the Maverick is modeled as a miss to represent the occasional miss, and (2) the MK-48 torpedo intentionally detonates in the water column immediately below the hull of the target. Unguided weapons are more frequently off-target and are modeled according to the statistical hit/miss ratios. Note that these hit/miss ratios are artificially low in order to demonstrate a worst-case scenario; they should not be taken as indicative of weapon or platform reliability.

Table D-6 – Representative SINKEX Weapons Firing Sequence

Time (Local)	Event Description
0900	Range Control Officer receives reports that the exercise area is clear of non-participant ship traffic, marine mammals, and sea turtles.
0909	Hellfire missile fired, hits target.
0915	2 HARM missiles fired, both hit target (5 minutes apart).
0930	1 Penguin missile fired, hits target.
0940	3 Maverick missiles fired, 2 hit target, 1 misses (5 minutes apart).
1145	1 SM-1 fired, hits target.
1147	1 SM-2 fired, hits target.
1205	5 Harpoon missiles fired, all hit target (1 minute apart).
1300-1335	7 live and 3 inert MK 82 bombs dropped – 7 hit target, 2 live and 1 inert miss target (4 minutes apart).
1355-1410	4 MK 83 bombs dropped – 3 hit target, 1 misses target (5 minutes apart).
1500	Surface gunfire commences – 400 5-inch rounds fired (one every 6 seconds), 280 hit target, 120 miss target.
1700	MK 48 Torpedo fired, hits, and sinks target.

D.3 ENVIRONMENTAL PROVINCES

Propagation loss ultimately determines the extent of the Zone of Influence (ZOI) for a particular source activity. In turn, propagation loss as a function of range responds to a number of environmental parameters:

- Water depth
- Sound speed variability throughout the water column
- Bottom geo-acoustic properties, and
- Surface roughness, as determined by wind speed

Due to the importance that propagation loss plays in Anti-Submarine Warfare (ASW) exercises, the Navy has, over the last four to five decades, invested heavily in measuring and modeling these environmental parameters. The result of this effort is the following collection of global databases of these environmental parameters, which are accepted as standards for Navy modeling efforts.

- Water depth - Digital Bathymetry Data Base Variable Resolution (DBDBV)
- Sound speed - Generalized Digital Environmental Model (GDEM)
- Bottom loss - Low-Frequency Bottom Loss (LFBL), Sediment Thickness Database, and High-Frequency Bottom Loss (HFBL), and
- Wind speed - U.S. Navy Marine Climatic Atlas of the World

This section provides a discussion of the relative impact of these various environmental parameters. These examples then are used as guidance for determining environmental provinces (that is, regions in which the environmental parameters are relatively homogeneous and can be represented by a single set of environmental parameters) within the TMAA.

D.3.1 Impact of Environmental Parameters

Within a typical operating area, the environmental parameter that tends to vary the most is bathymetry. It is not unusual for water depths to vary by an order of magnitude or more, resulting in significant impacts upon the ZOI calculations. Bottom loss can also vary considerably over typical operating areas but its impact upon ZOI calculations tends to be limited to waters on the continental shelf and the upper portion of the slope. Generally, the primary propagation paths in deep water, from the source to most of the ZOI volume, do not involve any interaction with bottom. In shallow water, particularly if the sound velocity profile directs all propagation paths to interact with the bottom, bottom loss variability can play a larger role.

The spatial variability of the sound speed field is generally small over operating areas of typical size. The presence of a strong oceanographic front is a noteworthy exception to this rule. To a lesser extent, variability in the depth and strength of a surface duct can be of some importance. In the mid-latitudes, seasonal variation often provides the most significant variation in the sound speed field. For this reason, both summer and winter profiles are modeled for each selected environment.

D.3.2 Environmental Provincing Methodology

The underwater acoustic environment can be quite variable over ranges in excess of ten kilometers. For ASW applications, ranges of interest are often sufficiently large as to warrant the modeling of the spatial variability of the environment. In the propagation loss calculations, each of the environmental parameters is allowed to vary (either continuously or discretely) along the path from acoustic source to receiver. In such applications, each propagation loss calculation is conditioned upon the particular locations of the source and receiver.

On the other hand, the range of interest for marine animal harassment by most Naval activities is more limited. This reduces the importance of the exact location of source and marine animal and makes the modeling required more manageable in scope.

In lieu of trying to model every environmental profile that can be encountered in an operating area, this effort utilizes a limited set of representative environments. Each environment is characterized by a fixed water depth, sound velocity profile, and bottom loss type. The operating area is then partitioned into homogeneous regions (or provinces) and the most appropriately representative environment is assigned to each. This process is aided by some initial provincing of the individual environmental parameters. The Navy-standard high-frequency bottom loss database in its native form is globally partitioned into nine classes. Low-frequency bottom loss is likewise provinced in its native form, although it is not considered in the process of selecting environmental provinces. Only the broadband sources produce acoustic energy at the frequencies of interest for low-frequency bottom loss (typically less than 1 kHz); even for those sources the low-frequency acoustic energy is secondary to the energy above 1 kHz. The Navy-standard sound velocity profiles database is also available as a provinced subset. Only the Navy-standard bathymetry database varies continuously over the world's oceans. However, even this environmental parameter is easily provinced by selecting a finite set of water depth intervals. For this analysis "octave-spaced" intervals (10, 20, 50, 100, 200, 500, 1000, 2000, and 5000 m) provide an adequate sampling of water depth dependence.

ZOI volumes are then computed using propagation loss estimates derived for the representative environments. Finally, a weighted average of the ZOI volumes is taken over all representative environments; the weighting factor is proportional to the geographic area spanned by the environmental province.

The selection of representative environments is subjective. However, the uncertainty introduced by this subjectivity can be mitigated by selecting more environments and by selecting the environments that occur most frequently over the operating area of interest.

As discussed in the previous subsection, ZOI estimates are most sensitive to water depth. Unless otherwise warranted, at least one representative environment is selected in each bathymetry province. Within a bathymetry province, additional representative environments are selected as needed to meet the following requirements.

- In shallow water (less than 1,000 meters), bottom interactions occur at shorter ranges and more frequently; thus significant variations in bottom loss need to be represented.
- Surface ducts provide an efficient propagation channel that can greatly influence ZOI estimates. Variations in the mixed layer depth need to be accounted for if the water is deep enough to support the full extent of the surface duct.

Depending upon the size and complexity of the operating area, the number of environmental provinces tends to range from 5 to 20.

D.3.3 Description of Environmental Provinces

The TMAA is approximately 92,246 square kilometers of ocean located south of Prince William Sound and east of Kodiak Island. The TMAA encompasses Warning Area W-612 and extends from the continental shelf to the deep waters of the Gulf of Alaska. The acoustic sources described in subsection D2 are deployed throughout the TMAA. This subsection describes the representative environmental provinces selected for the GOA. For all of these provinces, the average wind speed in the winter is 19 knots and in the summer 12 knots.

The GOA contains a total of 20 distinct environmental provinces. These represent various combinations of six bathymetry provinces, two Sound Velocity Profile (SVP) provinces, and four High-Frequency Bottom Loss (HFBL) classes.

The bathymetry provinces represent depths ranging from 100 meters to typical deep-water depths (slightly more than 5,000 meters). Nearly two-thirds of the Exercise Area is characterized as deep-water (depths of 2,000 meters or more). The second most prevalent water depth, covering nearly one-quarter of the Exercise Area, is representative of waters near the continental shelf break. The remaining water depths provide only small contributions (individually less than 5%) to the analysis. The distribution of the bathymetry provinces over the GOA is provided in D-7.

Table D-7 – Distribution of Bathymetry Provinces in GOA

Province Depth (m)	Frequency of Occurrence
100	4.85 %
200	22.29 %
500	4.22 %
1000	4.53 %
2000	12.67 %
5000	51.44 %

The distribution of the two sound speed provinces found in the TMAA is presented in Table D-8.

Table D-8 – Distribution of Sound Speed Provinces in GOA

SVP Province	Frequency of Occurrence
21	30.46 %
22	69.54 %

The variation in sound speed profiles associated with these two provinces is significant. This is illustrated in Figure D-1 and D-2 that display the upper 1,000 meters of the winter and summer profiles, respectively. In the winter, province 21 is a classic half-channel profile. The strong near-surface (within the upper 200 meters) gradient is the likely product of thorough mixing by strong winter winds and some fresh water sources. The winter profile for province 22 features a strong surface duct to a depth of 100 meters, also the result of thorough mixing by the winter winds. In contrast to province 21, however, the surface layer is modestly warmer. Nonetheless, both profiles are conducive to favorable sound propagation from a near-surface source.

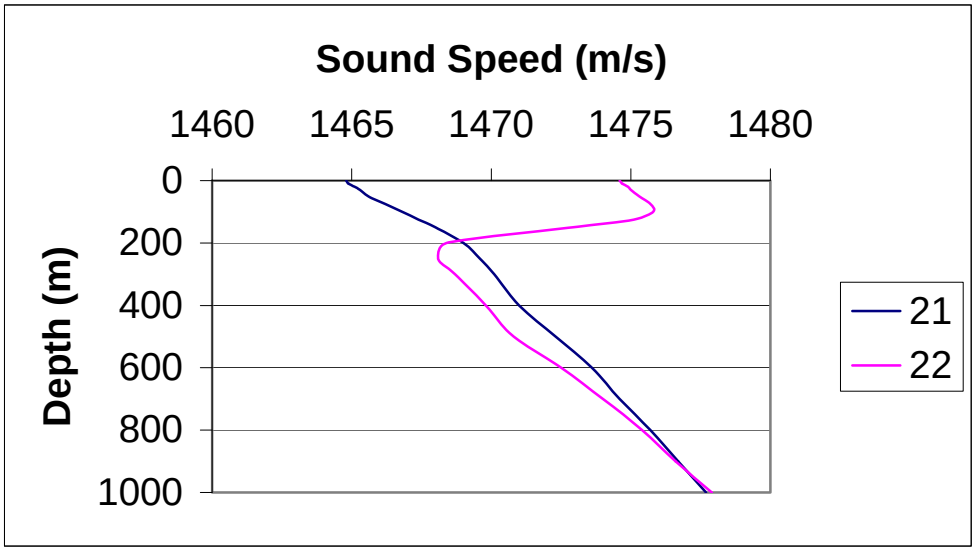


Figure D-1. – Winter SVPs in GOA

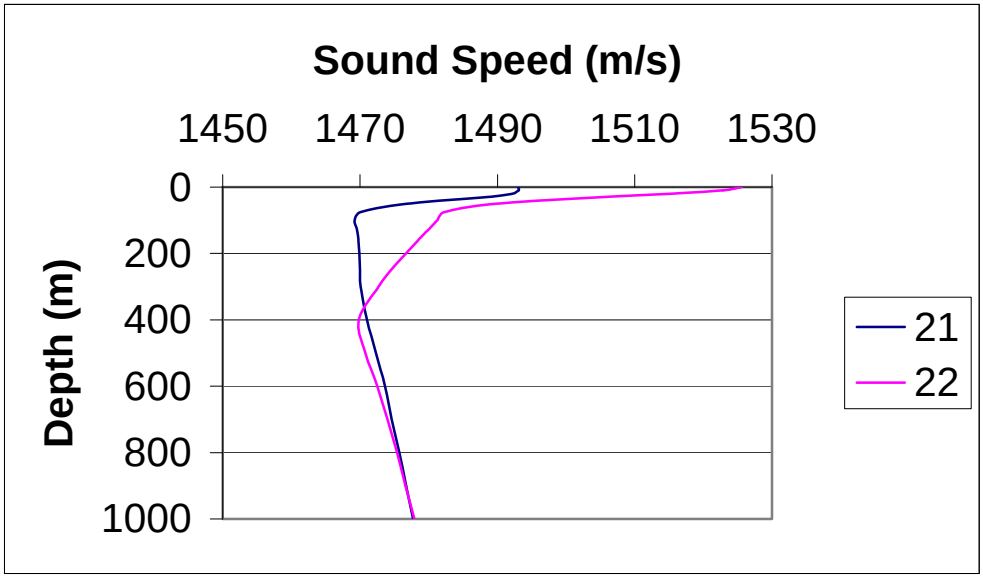


Figure D-2. – Summer SVPs in GOA

The summer profiles exhibit an even wider range of differences in the upper 200 meters (as much as 25 m/sec at the surface) with neither featuring a surface duct of significance. In the absence of surface loss considerations, both summer profiles would be less favorable than their winter counterparts for propagation from a near-surface source. However, the high wind speeds that are prevalent in the winter and the upward-refracting nature of the winter profiles appear to produce significantly higher surface scattering losses which can lead to summer being the season with the more favorable propagation.

The four HFBL classes represented in the GOA vary from low-loss bottoms (class 2, typically in shallow water) to high-loss bottoms (class 8). The four classes are fairly equally distributed as indicated in Table D-9 Distribution of High-Frequency Bottom Loss Classes in GOA. However, since two (classes 2 and 3) of the four classes are relatively low-loss, the bias in the environmental provinces will be towards low-loss bottoms.

Table D-9 – Distribution of High-Frequency Bottom Loss Classes in GOA

HFBL Class	Frequency of Occurrence
2	28.28 %
3	22.60 %
5	22.70 %
8	26.42 %

The logic for consolidating the environmental provinces focuses upon water depth, using the sound speed profile (in deep water) and the HFBL class (in shallow water) as secondary differentiating factors. The first consideration was to ensure that all six bathymetry provinces are represented. Then within each bathymetry province further partitioning of provinces proceeded as follows:

- The three shallowest bathymetry provinces are each represented by one environmental province. In each case, the bathymetry province is dominated (in some cases almost exclusively) by a single HFBL class, so that the secondary differentiating environmental parameter is of no consequence.
- The 1000-meter bathymetry province has two environmental provinces (differing in SVP province only) that occur in small, but relatively equal portions. Although they collectively

represent less than 5% of the TMAA, both are included in the analysis to ensure thoroughness. A third environmental province with a different HFBL class is not encountered enough to warrant consideration.

- The 2000-meter bathymetry province contains two environmental provinces that feature different SVP provinces. Both occur with sufficient frequency to warrant inclusion in the analysis.
- The 5000-meter bathymetry province consists of five environmental provinces. Four of these provinces are maintained for analysis; the fifth province is representative of less than one percent of the TMAA and for that reason, is excluded from consideration.

The distribution of the resulting eleven environmental provinces used in the acoustic modeling is summarized in Table D-10 and depicted in Figure D-3.

Table D-10 – Distribution of Environmental Provinces in TMAA

Environmental Province	Water Depth	SVP Province	Frequency of Occurrence
1	100 m	21	4.85 %
2	200 m	21	22.29 %
3	500 m	21	4.22 %
4	1000 m	21	2.32 %
5	1000 m	22	2.21 %
6	2000 m	21	10.61 %
7	2000 m	22	2.06 %
8	5000 m	21	22.60 %
9	5000 m	21	21.20 %
10	5000 m	22	1.51 %
11	5000 m	21	6.13 %

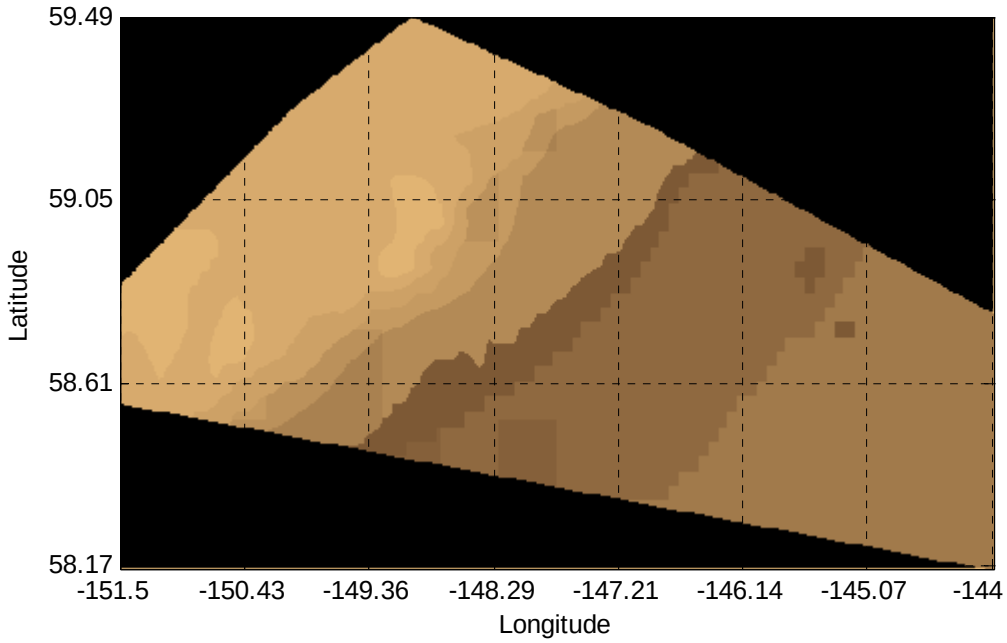


Figure D-3. – Distribution of Environmental Provinces in the TMAA

On this plot, darker-colored regions correspond to higher environmental province numbers, and hence depict deeper regions of the TMAA.

SINKEX operations are restricted to areas outside of 50 nautical miles (nm) from land and in waters deeper than 1,000 fathoms (or 1,852 meters). These limitations result not only in a smaller set of environments for analysis but also different frequencies of occurrence as indicated in Table D-11.

Table D-11 – Distribution of Environmental Provinces in the TMAA SINKEX Area

Environmental Province	Water Depth	SVP Province	Sediment Thickness	Frequency of Occurrence
1	2000 m	21	0.2 secs	7.15 %
2	5000 m	21	0.94 secs	35.55 %
3	5000 m	21	0.29 secs	9.04 %
4	5000 m	21	0.81 secs	45.93 %
5	5000 m	22	0.92 secs	1.75 %
6	5000 m	22	0.67 secs	0.58 %

D.4 IMPACT VOLUMES AND IMPACT RANGES

Many naval actions include the potential to injure or harass marine animals in the neighboring waters through noise emissions. The number of animals exposed to potential harassment in any such action is dictated by the propagation field and the characteristics of the noise source.

The impact volume associated with a particular activity is defined as the volume of water in which some acoustic metric exceeds a specified threshold. The product of this impact volume with a volumetric animal density yields the expected value of the number of animals exposed to that acoustic metric at a level that exceeds the threshold. The acoustic metric can either be an energy term (energy flux density, either in a limited frequency band or across the full band) or a pressure term (such as peak pressure or positive impulse). The thresholds associated with each of these metrics define the levels at which half of the animals exposed will experience some degree of harassment (ranging from behavioral change to mortality).

Impact volume is particularly relevant when trying to estimate the effect of repeated source emissions separated in either time or space. Impact range, which is defined as the maximum range at which a particular threshold is exceeded for a single source emission, defines the range to which marine mammal activity is monitored in order to meet mitigation requirements.

With the exception of explosive sources, the sole relevant measure of potential harm to the marine wildlife due to sonar operations is the accumulated (summed over all source emissions) energy flux density received by the animal over the duration of the activity. Harassment measures for explosive sources include energy flux density and pressure-related metrics (peak pressure and positive impulse).

Regardless of the type of source, estimating the number of animals that may be injured or otherwise harassed in a particular environment entails the following steps.

- Each source emission is modeled according to the particular operating mode of the sonar. The "effective" energy source level is computed by integrating over the bandwidth of the source, scaling by the pulse length, and adjusting for gains due to source directivity. The location of the source at the time of each emission must also be specified.

- For the relevant environmental acoustic parameters, transmission loss (TL) estimates are computed, sampling the water column over the appropriate depth and range intervals. TL data are sampled at the typical depth(s) of the source and at the nominal center frequency of the source. If the source is relatively broadband, an average over several frequency samples is required.
- The accumulated energy within the waters that the source is "operating" is sampled over a volumetric grid. At each grid point, the received energy from each source emission is modeled as the effective energy source level reduced by the appropriate propagation loss from the location of the source at the time of the emission to that grid point and summed. For the peak pressure or positive impulse, the appropriate metric is similarly modeled for each emission. The maximum value of that metric, over all emissions, is stored at each grid point.
- The impact volume for a given threshold is estimated by summing the incremental volumes represented by each grid point for which the appropriate metric exceeds that threshold.
- Finally, the number of harassments is estimated as the "product" (scalar or vector, depending upon whether an animal density depth profile is available) of the impact volume and the animal densities.

This section describes in detail the process of computing impact volumes (that is, the first four steps described above). This discussion is presented in two parts: active sonars and explosive sources. The relevant assumptions associated with this approach and the limitations that are implied are also presented. The final step, computing the number of harassments is discussed in subsection D.6.

D.4.1 Computing Impact Volumes for Active Sound Sources

This section provides a detailed description of the approach taken to compute impact volumes for active sonars. Included in this discussion are:

- Identification of the underwater propagation model used to compute transmission loss data, a listing of the source-related inputs to that model, and a description of the output parameters that are passed to the energy accumulation algorithm.
- Definitions of the parameters describing each sonar type.
- Description of the algorithms and sampling rates associated with the energy accumulation algorithm.

D.4.1.1 Transmission Loss Calculations

Transmission loss (TL) data are pre-computed for each of two seasons in each of the environmental provinces described in the previous subsection using the Gaussian Ray Bundle (GRAB) propagation loss model (Keenan, 2000). The TL output consists of a parametric description of each significant eigenray (or propagation path) from source to animal. The description of each eigenray includes the departure angle from the source (used to model the source vertical directivity later in this process), the propagation time from the source to the animal (used to make corrections to absorption loss for minor differences in frequency and to incorporate a surface-image interference correction at low frequencies), and the transmission loss suffered along the eigenray path.

The frequency and source depth TL inputs are specified in Table D-12.

Table D-12 – TL Frequency and Source Depth by Type

SONAR	FREQUENCY	SOURCE DEPTH
SQS-53	3.5 kHz	7 m
AQS-22	4.1 kHz	27 m
ASQ-62	8 kHz	27 m
SQS-56	7.5 kHz	7 m
MK-84 Range Pingers	12.9 kHz	7m, 100m
PUTR Transponders	8.8 kHz	1,800 m
MK-39 EMATT	900 Hz	100 m
BQQ-10	Classified	100 m
BQS-15	Classified	50 m
SUS, MK-84	3.4 kHz	50 m

The eigenray data for a single GRAB model run are sampled at uniform increments in range out to a maximum range for a specific "animal" (or "target" in GRAB terminology) depth. Multiple GRAB runs are made to sample the animal depth dependence. The depth and range sampling parameters are summarized in Table D-13. Note that some of the low-power sources do not require TL data to large maximum ranges.

Table D-13 – TL Depth and Range Sampling Parameters by Sonar Type

SONAR	RANGE STEP	MAXIMUM RANGE	DEPTH SAMPLING
SQS-53	10 m	200 km	0 – 1 km in 5 m steps 1 km – Bottom in 10 m steps
AQS-22	10 m	10 km	0 – 1 km in 5 m steps 1 km – Bottom in 10 m steps
ASQ-62	5 m	5 km	0 – 1 km in 5 m steps 1 km – Bottom in 10 m steps
SQS-56	10 m	50 km	0 – 1 km in 5 m steps 1 km – Bottom in 10 m steps
MK-84 Range Pingers	5 m	15 km	0 – 1 km in 5 m steps 1 km – Bottom in 10 m steps
PUTR Transponders	5 m	15 km	0 – 1 km in 5 m steps 1 km – Bottom in 10 m steps
MK-39 EMATT	5 m	1 km	1 m steps
BQQ-10	Classified	Classified	0 – 1 km in 5 m steps 1 km – Bottom in 10 m steps
BQS-15	Classified	Classified	0 – 1 km in 5 m steps 1 km – Bottom in 10 m steps
SUS, MK-84	5 m	1 km	1 m steps

In a few cases, most notably the SQS-53 for levels below approximately 180 dB, TL data may be required by the energy summation algorithm at ranges greater than covered by the pre-computed GRAB data. In these cases, TL is extrapolated to the required range using a simple cylindrical spreading loss law in addition to the appropriate absorption loss. This extrapolation leads to a conservative (or under) estimate of transmission loss at the greater ranges.

Although GRAB provides the option of including the effect of source directivity in its eigenray output, this capability is not exercised. By preserving data at the eigenray level, this allows source directivity to be applied later in the process and results in fewer TL calculations.

The other important feature that storing eigenray data supports is the ability to model the effects of surface-image interference that persist over range. However, this is primarily important at frequencies lower than those associated with the sonars considered in this subsection. A detailed description of the modeling of surface-image interference is presented in the subsection on explosive sources.

D.4.1.2 Energy Summation

The summation of energy flux density over multiple pings in a range-independent environment is a trivial exercise for the most part. A volumetric grid that covers the waters in and around the area of sonar operation is initialized. The source then begins its set of pings. For the first ping, the TL from the source to each grid point is determined (summing the appropriate eigenrays after they have been modified by the vertical beam pattern), the "effective" energy source level is reduced by that TL, and the result is added to the accumulated energy flux density at that grid point. After each grid point has been updated, the accumulated energy at grid points in each depth layer is compared to the specified threshold. If the accumulated energy exceeds that threshold, then the incremental volume represented by that grid point is added to the impact volume for that depth layer. Once all grid points have been processed, the resulting sum of the incremental volumes represents the impact volume for one ping.

The source is then moved along one of the axes in the horizontal plane by the specified ping separation range and the second ping is processed in a similar fashion. Again, once all grid points have been processed, the resulting sum of the incremental volumes represents the impact volume for two pings. This procedure continues until the maximum number of pings specified has been reached.

Defining the volumetric grid over which energy is accumulated is the trickiest aspect of this procedure. The volume must be large enough to contain all volumetric cells for which the accumulated energy is likely to exceed the threshold but not so large as to make the energy accumulation computationally unmanageable.

Determining the size of the volumetric grid begins with an iterative process to determine the lateral extent to be considered. Unless otherwise noted, throughout this process the source is treated as omni-directional and the only animal depth that is considered is the TL target depth that is closest to the source depth (placing source and receiver at the same depth is generally an optimal TL geometry).

The first step is to determine the impact range (R_{max}) for a single ping. The impact range in this case is the maximum range at which the effective energy source level reduced by the transmission loss is greater than the threshold. Next, the source is moved along a straight-line track and energy flux density is accumulated at a point that has a CPA range of R_{max} at the mid-point of the source track. That total energy flux density summed over all pings is then compared to the prescribed threshold. If it is greater than the threshold (which, for the first R_{max}, it must be) then R_{max} is increased by ten percent, the accumulation process is repeated, and the total energy is again compared to the threshold. This continues until R_{max} grows large enough to ensure that the accumulated energy flux density at that lateral range is less than the threshold. The lateral range dimension of the volumetric grid is then set at twice R_{max}, with the grid centered along the source track. In the direction of advance for the source, the volumetric grid extends on the interval from [$-R_{max}$, 3 R_{max}] with the first source position located at zero in this dimension. Note that the source motion in this direction is limited to the interval [0, 2 R_{max}]. Once the source reaches 2 R_{max} in this direction, the incremental volume contributions have approximately reached their asymptotic limit and further pings add essentially the same amount. This geometry is demonstrated in Figure D-4 below.

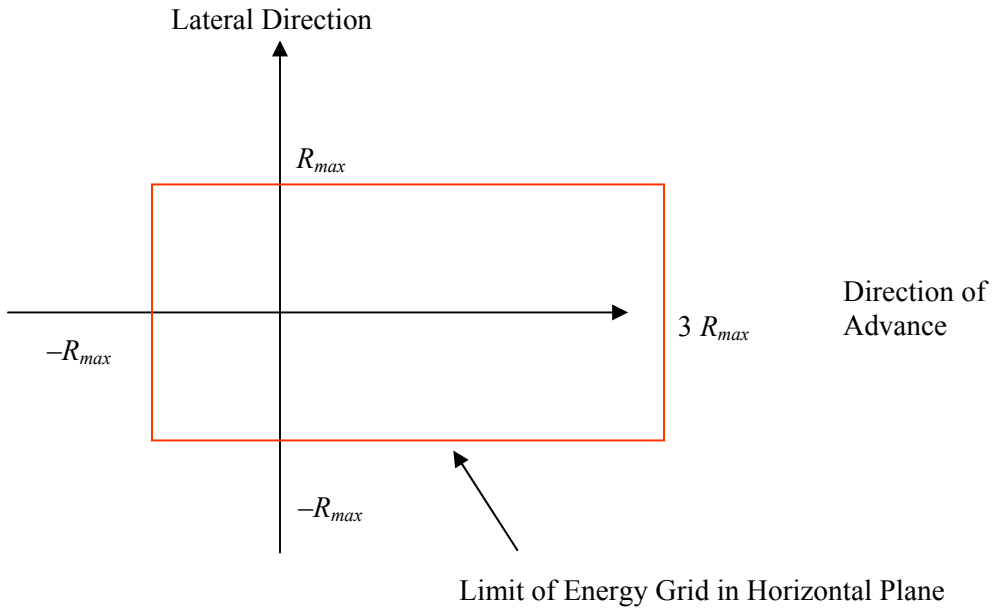


Figure D-4. Horizontal Plane of Volumetric Grid for Omni Directional Source

If the source is directive in the horizontal plane, then the lateral dimension of the grid may be reduced and the position of the source track adjusted accordingly. For example, if the main lobe of the horizontal source beam is limited to the starboard side of the source platform, then the port side of the track is reduced substantially as demonstrated in Figure D-5.

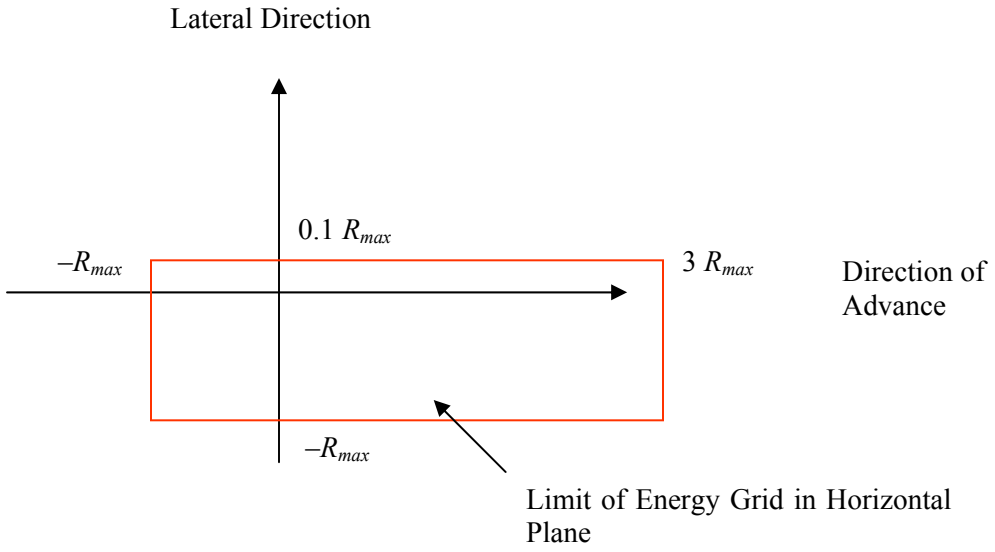


Figure D-5. Horizontal Plane of Volumetric Grid for Starboard Beam Source

Once the extent of the grid is established, the grid sampling can be defined. In both dimensions of the horizontal plane the sampling rate is approximately $R_{max}/100$. The round-off error associated with this sampling rate is roughly equivalent to the error in a numerical integration to determine the area of a circle with a radius of R_{max} with a partitioning rate of $R_{max}/100$ (approximately one percent). The depth-sampling rate of the grid is comparable to the sampling rates in the horizontal plane but discretized to match an actual TL sampling depth. The depth-sampling rate is also limited to no more than ten meters to ensure that significant TL variability over depth is captured.

D.4.1.3 Impact Volume per Hour of Source Operation

The impact volume for a source moving relative to the animal population increases with each additional ping. The rate at which the impact volume increases varies with a number of parameters but eventually approaches some asymptotic limit. Beyond that point the increase in impact volume becomes essentially linear as depicted in Figure D-6 using the SQS-53 as an example.

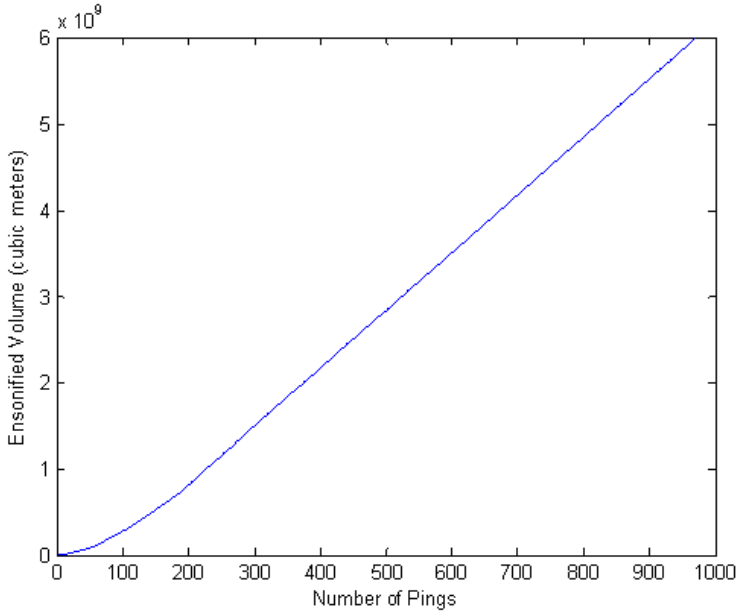


Figure D-6. SQS-53 Impact Volume by Ping

The slope of the asymptotic limit of the impact volume at a given depth is the impact volume added per ping. This number multiplied by the number of pings in an hour gives the hourly impact volume for the given depth increment. Completing this calculation for all depths in a province, for a given source, gives the hourly impact volume vector, v_n, which contains the hourly impact volumes by depth for province n. Figure D-7 provides an example of an hourly impact volume vector for a particular environment.

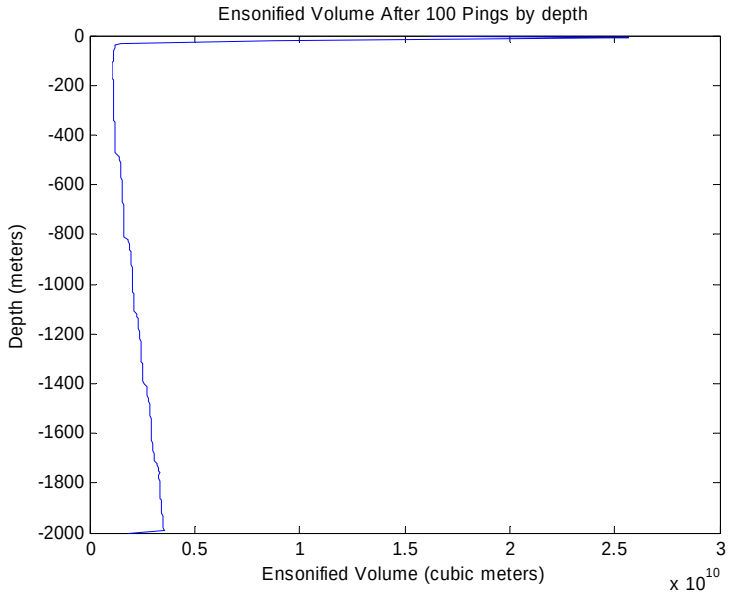


Figure D-7. Example of an Impact Volume Vector

D.4.2 Computing Impact Volumes for Explosive Sources

This section provides the details of the modeling of the explosive sources. This energy summation algorithm is similar to that used for sonars, only differing in details such as the sampling rates and source parameters. These differences are summarized in the following subsections. A more significant difference is that the explosive sources require the modeling of additional pressure metrics: (1) peak pressure, and (2) "modified" positive impulse. The modeling of each of these metrics is described in detail in the subsections of D.4.2.3.

D.4.2.1 Transmission Loss Calculations

Modeling impact volumes for explosive sources span requires the same type of TL data as needed for active sonars. However unlike active sonars, explosive ordnances and the EER source are broadband, contributing significant energy from tens of Hertz to tens of kilohertz. To accommodate the broadband nature of these sources, TL data are sampled at seven frequencies from 10 Hz to 40 kHz, spaced every two octaves.

An important propagation consideration at low frequencies is the effect of surface-image interference. As either source or target approach the surface, pairs of paths that differ by a single surface reflection set up an interference pattern that ultimately causes the two paths to cancel each other when the source or target is at the surface. A fully coherent summation of the eigenrays produces such a result but also introduces extreme fluctuations that would have to be highly sampled in range and depth, and then smoothed to give meaningful results. An alternative approach is to implement what is sometimes called a semi-coherent summation. A semi-coherent sum attempts to capture significant effects of surface-image interference (namely the reduction of the field due to destructive interference of reflected paths as the source or target approach the surface) without having to deal with the more rapid fluctuations associated with a fully coherent sum. The semi-coherent sum is formed by a random phase addition of paths that have already been multiplied by the expression:

$$\sin^2\left(\frac{4\pi f z_s z_a}{c^2 t}\right)$$

where f is the frequency, z_s is the source depth, z_a is the animal depth, c is the sound speed and t is the travel time from source to animal along the propagation path. For small arguments of the sine function this expression varies directly as the frequency and the two depths. It is this relationship that causes the propagation field to go to zero as the depths approach the surface or the frequency approaches zero.

This surface-image interference must be applied across the entire bandwidth of the explosive source. The TL field is sampled at several representative frequencies. However, the image-interference correction given above varies substantially over that frequency spacing. To avoid possible under sampling, the image-interference correction is averaged over each frequency interval.

D.4.2.2 Source Parameters

Unlike active sonars, explosive sources are defined by only two parameters: (1) net explosive weight, and (2) source detonation depth. Values for these source parameters are defined earlier in subsection D.2.2.

The effective energy source level, which is treated as a de facto input for the other sources, is instead modeled directly for SSQ-110 explosive sonobuoys and munitions. For both, the energy source level is comparable to the model used for other explosives (Arons (1954), Weston (1960), McGrath (1971), Urick (1983), Christian and Gaspin (1974)). The energy source level over a one-third octave band with a center frequency of f for a source with a net explosive weight of w pounds is given by:

$$\text{ESL} = 10 \log_{10} (0.26\, f) + 10 \log_{10} (2\, p_{max}^2 / [1/\theta^2 + 4\, \pi\, f^2]) + 197 \text{ dB}$$

where the peak pressure for the shock wave at 1 meter is defined as

$$p_{max} = 21600\, (w^{1/3} / 3.28\,)^{1.13} \text{ psi} \qquad \text{(A-1)}$$

and the time constant is defined as:

$$\theta = [(0.058)\, (w^{1/3})\, (3.28 / w^{1/3})^{\,0.22}\,] / 1000 \text{ msec} \qquad \text{(A-2)}$$

In contrast to munitions that are modeled as omni-directional sources, the SSQ-110 is a directed source consisting of two explosive strips that are fired simultaneously from the center of the array. Each strip generates a beam pattern with the steer direction of the main lobe determined by the burn rate. The resulting response of the entire array is a bifurcated beam for frequencies above 200 Hz, while at lower frequencies the two beams tend to merge into one.

Since very short ranges are under consideration, the loss of directivity of the array needs to be accounted for in the near field of the array. This is accomplished by modeling the sound pressure level across the field as the coherent sum of contributions of infinitesimal sources along the array that are delayed according to the burn rate. For example, for frequency f the complex pressure contribution at a depth z and horizontal range r from an infinitesimal source located at a distance z' above the center of the array is

$$p(r,z) = e^{\,i\phi}$$

where

$\phi = kr' + \alpha z'$, and

$\alpha = 2\ \pi f / c_b$

with k the acoustic wave number, c_b the burn rate of the explosive ribbon, and r' the slant range from the infinitesimal source to the field point (x,z).

Beam patterns as function of vertical angle are then sampled at various ranges out to a maximum range that is approximately L^2 / λ where L is the array length and λ is the wavelength. This maximum range is a rule-of-thumb estimate for the end of the near field (Bartberger, 1965). Finally, commensurate with the resolution of the TL samples, these beam patterns are averaged over octave bands.

A couple of sample beam patterns are provided in Figure D-8 and Figure D-9. In both cases, the beam response is sampled at various ranges from the source array to demonstrate the variability across the near field. The 80-Hz family of beam patterns presented in Figure D-8 shows the rise of a single main lobe as range increases.

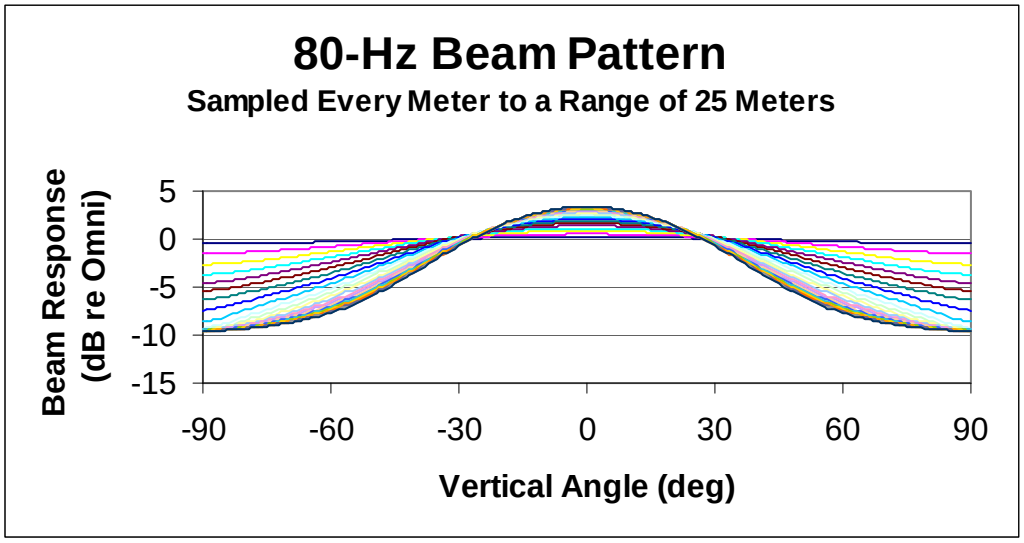


Figure D-8. 80-Hz Beam Patterns across Near Field of EER Source

On the other hand, the 1,250-Hz family of beam patterns depicted in Figure D-9 demonstrates the typical high-frequency bifurcated beam.

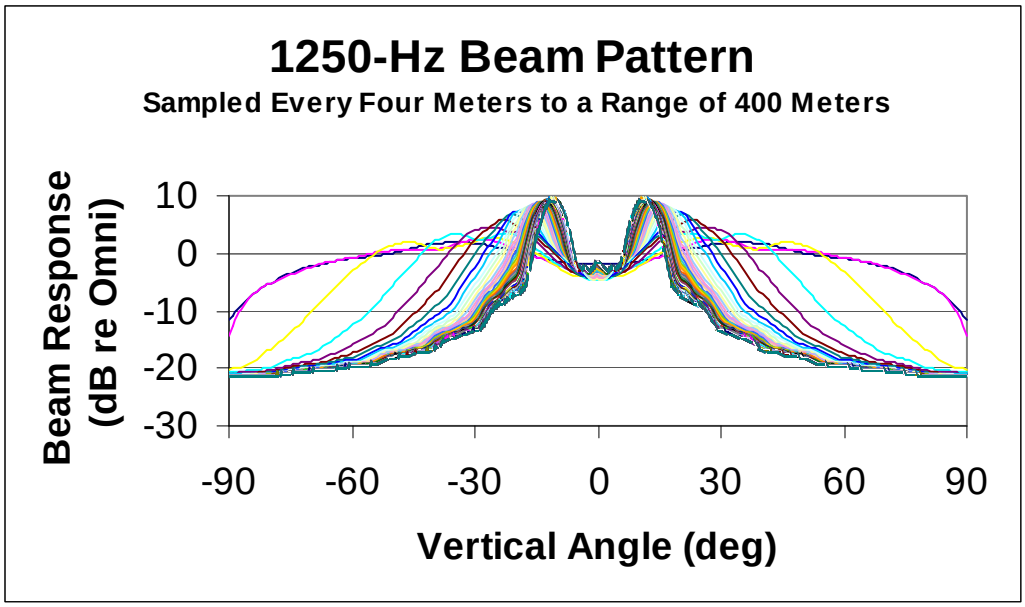


Figure D-9. 1250-Hz Beam Patterns across Near Field of SSQ-110 Source

D.4.2.3 Impact Volumes for Various Metrics

The impact of explosive sources on marine wildlife is measured by three different metrics, each with its own thresholds. The energy metric, peak one-third octave, is treated in similar fashion as the energy metric used for the active sonars, including the summation of energy if there are multiple source emissions. The other two, peak pressure and positive impulse, are not accumulated but rather the maximum levels are taken.

Peak One-Third Octave Energy Metric

The computation of impact volumes for the energy metric closely follows the approach taken to model the energy metric for the active sonars. The only significant difference is that energy flux density is sampled at several frequencies in one-third-octave bands and only the peak one-third-octave level is accumulated over time.

Peak Pressure Metric

The peak pressure metric is a simple, straightforward calculation at each range/animal depth combination. First, the transmission ratio, modified by the source level in a one-octave band and the vertical beam pattern, is averaged across frequency on an eigenray-by-eigenray basis. This averaged transmission ratio (normalized by the total broadband source level) is then compared across all eigenrays with the maximum designated as the peak arrival. Peak pressure at that range/animal depth combination is then simply the product of:

- The square root of the averaged transmission ratio of the peak arrival,
- The peak pressure at a range of 1 meter (given by equation A-1), and
- The similitude correction (given by $r^{-0.13}$, where r is the slant range along the eigenray estimated as *tc* with *t* the travel time along the dominant eigenray and *c* the nominal speed of sound).

If the peak pressure for a given grid point is greater than the specified threshold, then the incremental volume for the grid point is added to the impact volume for that depth layer.

"Modified" Positive Impulse Metric

The modeling of positive impulse follows the work of Goertner (Goertner, 1982). The Goertner model defines a "partial" impulse as

$$\int_0^{T_{min}} p(t)\, dt$$

where $p(t)$ is the pressure wave from the explosive as a function of time t, defined so that $p(t) = 0$ for $t < 0$. This pressure wave is modeled as

$$p(t) = p_{max}\, e^{-t/\theta}$$

where p_{max} is the peak pressure at 1 meter (see, equation B-1), and θ is the time constant defined as

$$\theta = 0.058\, w^{1/3}\, (r/w^{1/3})^{0.22} \text{ seconds}$$

with w the net explosive weight (pounds), and r the slant range between source and animal.

The upper limit of the "partial" impulse integral is

$$T_{min} = \min \{T_{cut}, T_{osc}\}$$

where T_{cut} is the time to cutoff and T_{osc} is a function of the animal lung oscillation period. When the upper limit is T_{cut}, the integral is the definition of positive impulse. When the upper limit is defined by T_{osc}, the integral is smaller than the positive impulse and thus is just a "partial" impulse. Switching the integral limit from T_{cut} to T_{osc} accounts for the diminished impact of the positive impulse upon the animals lungs that compress with increasing depth and leads to what is sometimes call a "modified" positive impulse metric.

The time to cutoff is modeled as the difference in travel time between the direct path and the surface-*reflected* path in an isospeed environment. At a range of r, the time to cutoff for a source depth z_s and an animal depth z_a is

$$T_{cut} = 1/c\ \{\ [r^2 + (z_a + z_s)^2]^{1/2} - [r^2 + (z_a - z_s)^2]^{1/2}\ \}$$

where c is the speed of sound.

The *animal* lung oscillation period is a function of animal mass M and depth z_a and is modeled as

$$T_{osc} = 1.17\, M^{1/3}\, (1 + z_a/33)^{-5/6}$$

where M is the animal mass (in kg) and z_a is the animal depth (in feet).

The modified positive impulse threshold is unique among the various injury and harassment metrics in that it is a function of depth and the animal weight. So instead of the user specifying the threshold, it is computed as $K\ (M/42)^{1/3}\ (1 + z_a/33)^{1/2}$. The coefficient K depends upon the level of exposure. For the onset of slight lung injury, K is 19.7; for the onset of extensive lung hemorrhaging (1% mortality), K is 47.

Although the thresholds are a function of depth and animal weight, sometimes they are summarized as their value at the sea surface for a typical dolphin calf (with an average mass of 12.2 kg). For the onset of slight lung injury, the threshold at the surface is approximately 13 psi-msec; for the onset of extensive lung hemorrhaging (1% mortality), the threshold at the surface is approximately 31 psi-msec.

As with peak pressure, the "modified" positive impulse at each grid point is compared to the derived threshold. If the impulse is greater than that threshold, then the incremental volume for the grid point is added to the impact volume for that depth layer.

D.4.2.4 Impact Volume per Explosive Detonation

The detonations of explosive sources are generally widely spaced in time and/or space. This implies that the impact volume for multiple firings can be easily derived by scaling the impact volume for a single detonation. Thus the typical impact volume vector for an explosive source is presented on a per-detonation basis.

D.4.3 Impact Volume by Region

The TMAA is described by eleven (11) environmental provinces. The hourly impact volume vector for operations involving any particular source is a linear combination of the eleven impact volume vectors with the weighting determined by the distribution of those eleven environmental provinces within the range. Unique hourly impact volume vectors for winter and summer are calculated for each type of source and each metric/threshold combination.

D.5 RISK FUNCTION: THEORETICAL AND PRACTICAL IMPLEMENTATION

This section discusses the recent addition of a risk function response "threshold" to acoustic effects analysis procedure. This approach includes two parts, a metric, and a function to map exposure level under the metric to probability of harassment for acoustic sources. What these two parts mean, how they affect exposure calculations, and how they are implemented are the objects of discussion.

D.5.1 Thresholds and Metrics

The term "thresholds" is broadly used to refer to both thresholds and metrics. The difference, and the distinct roles of each in effects analyses, will be the foundation for understanding the dose-response approach, putting it in perspective, and showing that, conceptually, it is similar to past approaches.

Sound is a pressure wave, so at a certain point in space, sound is simply rapidly changing pressure. Pressure at a point is a function of time. Define $p(t)$ as pressure (in micropascals) at a given point at time t (in seconds); this function is called a "time series." Figure D-10 gives the time series of the first "hallelujah" in Handel's Hallelujah Chorus.

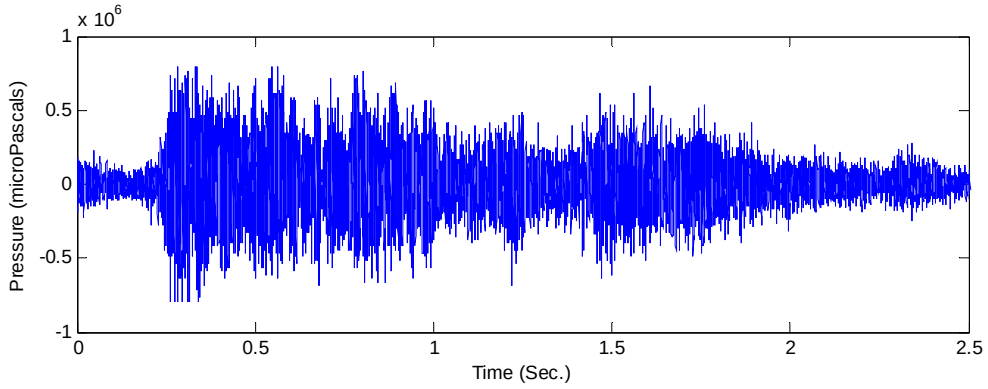


Figure D-10. Time Series

The time-series of a source can be different at different places. Therefore, sound, or pressure, is not only a function of time, but also of location. Let the function $p(t)$, then be expanded to $p(t;x,y,z)$ and denote the time series at point (x,y,z) in space. Thus, the series in Figure D-10 $p(t)$ is for a given point (x,y,z). At a different point in space, it would be different.

Assume that the location of the source is (0,0,0) and this series is recorded at (0,10,-4). The time series above would be p(t;0,10,-4) for 0<t<2.5.

As in Figure D-10, pressure can be positive or negative, but acoustic power, which is proportional to the square of the pressure, is always positive, this makes integration meaningful. Figure D-11 is $p^2(t;0,10,-4)$.

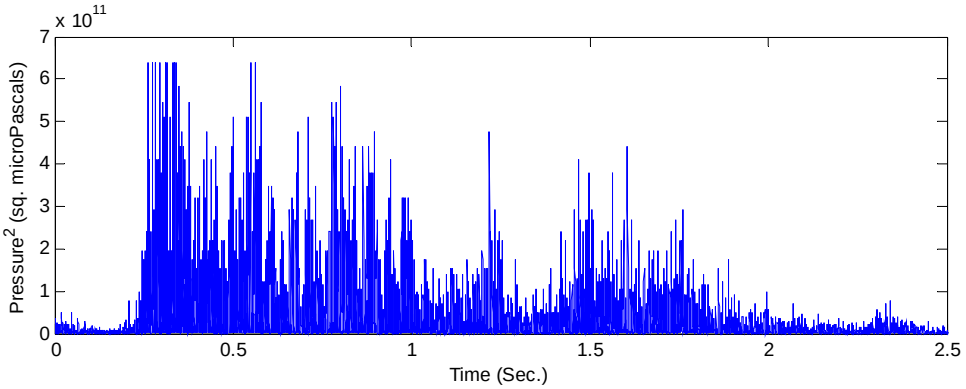


Figure D-11. Time Series Squared

The metric chosen to evaluate the sound field at the end of this first "hallelujah" determines how the time series is summarized from thousands of points, as in Figure D-10, to a single value for each point (x,y,z) in the space. The metric essentially "boils down" the four dimensional $p(t,x,y,z)$ into a three dimensional function $m(x,y,z)$ by dealing with time. There is more than one way to summarize the time component, so there is more than one metric.

D.5.2 Maximum Sound Pressure Level

Because of the large dynamic range of the acoustic power, it is generally represented on a logarithmic scale using sound pressure levels (SPLs). SPL is actually the ratio of acoustic power and density (power/unit area = $\frac{p^2}{Z}$ where Z = ρc is the acoustic impedance). This ratio is presented on a logarithmic scale relative to a reference pressure level, and is defined as:

$$SPL = 10\log_{10}\left(\frac{p^2}{p_{ref}^2}\right) = 20\log_{10}\left(abs\left(\frac{p}{p_{ref}}\right)\right)$$

(Note that SPL is defined in dB re a reference pressure, even though it comes from a ratio of powers.)

One way to characterize the power of the time series $p(t;x,y,z)$ with a single number over the 2.5 seconds is to only report the maximum SPL value of the function over time or,

$SPL_{\max} = \max\left\{10\log_{10}\left(p^2(t,x,y,z)\right)\right\}$ (relative to a reference pressure of 1μPa^2-s) for 0<t<2.5

The $SPL_{\max}$ for this snippet of the Hallelujah Chorus is $10\log_{10}\left(6.4\times10^{11}\,\mu Pa^2\,/1\mu Pa^2\right) = 118\,dB$ re 1μPa^2-s and occurs at 0.2606 seconds, as shown in Figure D-12.

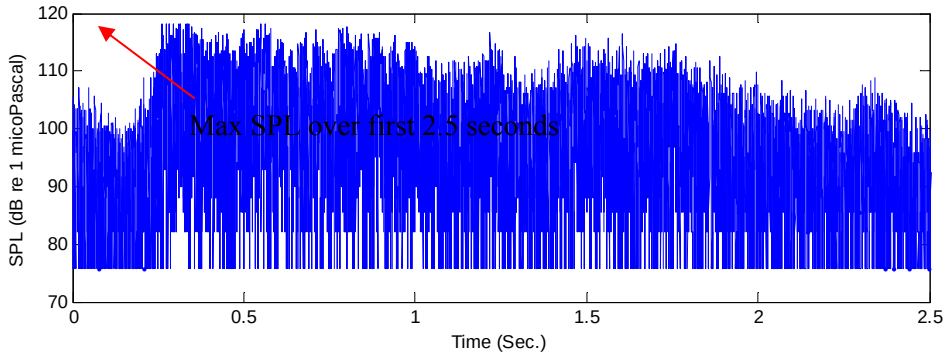


Figure D-12. Max SPL of Time Series Squared

D.5.3 Integration

$SPL_{\max}$ is not necessarily influenced by the duration of the sound (2.5 seconds in this case). Integrating the function over time gives the EFD, which accounts for this duration. A simple integration of $p^2(t;x,y,z)$ over t is common and is proportional to the EFD at (x,y,z). Because we will again be dealing in levels (logarithms of ratios), we neglect the impedance and simply measure the square of the pressure:

$Energy = \int_0^T p^2(t,x,y,z)dt$, where T is the maximum time of interest in this case 2.5.

The energy for this snippet of the Hallelujah Chorus is $8.47 \times 10^{10}\ \mu Pa^2 \cdot s$. This would more commonly be reported as an energy level (EL):

$$EL = 10\log_{10}\left(\frac{\int_0^T p^2(t,x,y,z)dt}{1.0\mu Pa^2 s}\right) = \text{ 109.3 dB re 1µPa}^2\text{-s}$$

Energy is sometimes called "equal energy" because if $p(t)$ is a constant function and the duration is doubled, the effect is the same as doubling the signal amplitude (y value). Thus, the duration and the signal have an "equal" influence on the energy metric.

Mathematically we have

$$\int_0^{2T} p(t)^2\,dt = 2\int_0^T p(t)^2\,dt = \int_0^T 2\,p(t)^2\,dt$$

or a doubling in duration equals a doubling in energy equals a doubling in signal.

Sometimes, the integration metrics are referred to as having a "3 dB exchange rate" because if the duration is doubled, this integral increases by a factor of two, or 10log10(2)=3.01 dB. Thus, equal energy has "a 3 dB exchange rate."

After *p(t)* is determined (i.e., when the stimulus is over), propagation models can be used to determine *p(t;x,y,z)* for every point in the vicinity and for a given metric. Define

$$m_a(x,y,z,T) = \text{value of metric "}a\text{" at point } (x,y,z) \text{ after time } T$$

So,

$$m_{energy}(x,y,z;T) = \int_0^T p(t)^2\,dt$$

$$m_{\max SPL}(x,y,z;T) = \max 10\log_{10}\left(p^2(t)\right) over\ [0,T]$$

Since modeling is concerned with the effects of an entire event, T is usually implicitly defined: a number that captures the duration of the event. This means that $m_a(x,y,z)$ is assumed to be measured over the duration of the received signal.

D.5.3.1 Three Dimensions versus Two Dimensions

To further reduce the calculation burden, it is possible to reduce the domain of $m_a(x,y,z)$ to two dimensions by defining $m_a(x,y) = \max\{m_a(x,y,z)\}$ over all z. This reduction is not used for this analysis, which is exclusively three-dimensional.

D.5.4 Threshold

For a given metric, a threshold is a function that gives the probability of exposure at every value of m_a. This threshold function will be defined as

$$D(m_a(x,y,z)) = P(effect\ at\ m_a(x,y,z))$$

The domain of *D* is the range of $m_a(x,y,z)$, and the range of *D* is [0,1].

An example of threshold functions is the heavyside (or unit step) function, currently used to determine permanent and temporary threshold shift (PTS and TTS) in cetaceans. For PTS, the metric is $m_{energy}(x,y,z)$, defined above, and the threshold function is a heavyside function with a discontinuity at 215 dB, shown in Figure D-13.

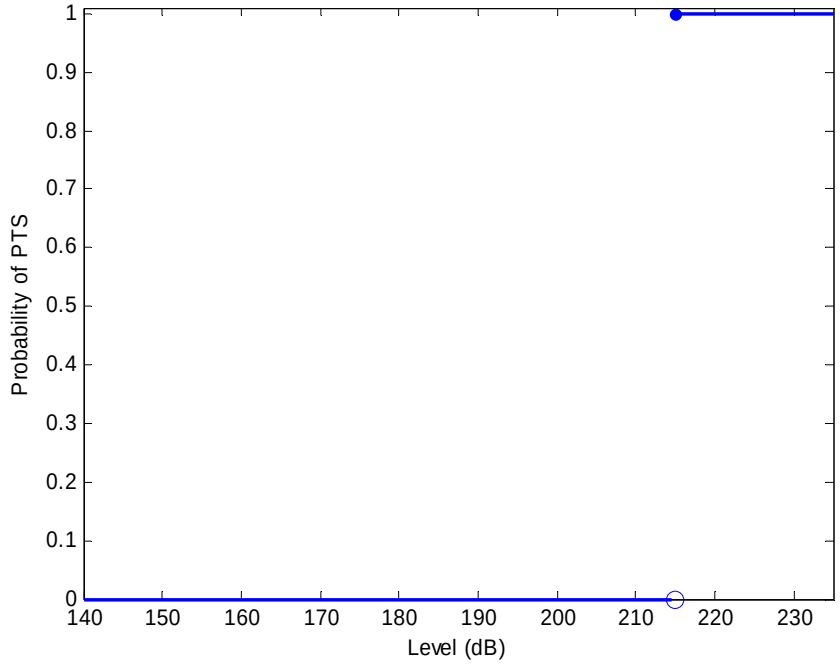


Figure D-13. PTS Heavyside Threshold Function

Symbolically, this *D* is defined as:

$$D(m_{energy}) = \begin{cases} 0\ for\ m_{energy} < 215 \\ 1\ for\ m_{energy} \geq 215 \end{cases}$$

Any function can be used for D, as long as its range is in [0,1]. The risk function uses normal Feller risk functions (defined below) instead of heavyside functions, and use the max SPL metric instead of the energy metric. While a heavyside function is specified by a single parameter, the discontinuity, a Feller function requires three parameters: the basement cutoff value, the level above the basement for 50% effect, and a steepness parameter. Mathematically, these Feller, "risk" functions, *D*, are defined as

$$D(m_{\max SPL}) = \begin{cases} \dfrac{1}{1+\left(\dfrac{K}{m_{\max SPL}-B}\right)^{A}} & for\ m_{\max SPL} \geq B \\ 0 & for\ m_{\max SPL} < B \end{cases}$$ 1

where B = cutoff (or basement), K = the difference in level (dB) between the basement and the median (50% effect) harassment level, and A = the steepness factor. The dose function for odontocetes and pinnipeds uses the parameters:

B = 120 dB,

K = 45 dB, and

A = 10.

The dose function for mysticetes uses:

B = 120 dB,

K = 45 dB, and

A = 8.

Harbor porpoises are a special case. Though the metric for their behavioral harassment is also SPL, their risk function is a heavyside step function with a harassment threshold discontinuity (0 % to 100 %) at 120 dB. All other species use the continuous Feller risk-function for evaluating expected harassment.

D.5.5 Calculation of Expected Exposures

Determining the number of expected exposures for disturbance is the object of this analysis.

$$\text{Expected exposures in volume V} = \int_V \rho(V) D(m_a(V)) dV$$

For this analysis, $m_a = m_{\max SPL}$, so

$$\int_V \rho(V) D\big(m_a(V)\big) dV = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty}\int_{-\infty}^{\infty} \rho(x,y,z) D(m_{\max SPL}(x,y,z))\, dx\, dy\, dz$$

In this analysis, the densities are constant over the xy-plane, and the z dimension is always negative, so this reduces to

$$\int_{-\infty}^{0} \rho(z) \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} D(m_{\max SPL}(x,y,z))\, dx\, dy\, dz$$

1 The equation can also be represented as shown in Section 3.8.6.3 of this EIS/OEIS

D.5.6 Numeric Implementation

Numeric integration of $\int_{-\infty}^{0} \rho(z) \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} D(m_{\max SPL}(x, y, z))\, dx\, dy\, dz$ can be involved because, although the bounds are infinite, D is non-negative out to 120 dB, which, depending on the environmental specifics, can drive propagation loss calculations and their numerical integration out to more than 100 km.

The first step in the solution is to separate out the *xy*-plane portion of the integral:

$$\text{Define } f(z) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} D(m_{\max SPL}(x, y, z))\, dx\, dy\,.$$

Calculation of this integral is the most involved and time consuming part of the calculation. Once it is complete,

$$\int_{-\infty}^{0} \rho(z) \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} D(m_{\max SPL}(x, y, z))\, dx\, dy\, dz = \int_{-\infty}^{0} \rho(z) f(z) dz\,,$$

which, when numerically integrated, is a simple dot product of two vectors.

Thus, the calculation of *f(z)* requires the majority of the computation resources for the numerical integration. The rest of this section presents a brief outline of the steps to calculate *f(z)* and preserve the results efficiently.

The concept of numerical integration is, instead of integrating over continuous functions, to sample the functions at small intervals and sum the samples to approximate the integral. Smaller sized intervals yield closer approximations with longer calculation time, so a balance between accuracy and time is determined in the decision of step size. For this analysis, z is sampled in 5 meter steps to 1000 meters in depth and 10 meter steps to 2000 meters, which is the limit of animal depth in this analysis. The step size for x is 5 meters, and y is sampled with an interval that increases as the distance from the source increases. Mathematically,

$$z \in Z = \{0,5,...1000,1010,...,2000\}$$
$$x \in X = \{0,\pm 5,...,\pm 5k\}$$
$$y \in Y = \left\{0,\pm 5 * (1.005)^0, \pm 5 * \left[(1.005)^0 + (1.005)^1\right], ..., \pm 5 * \left[\sum_{i=0}^{j} (1.005)^i\right]\right\}$$

for integers k, j, which depend on the propagation distance for the source. For this analysis, k = 20,000 and j = 600.

With these steps, $f(z_0) = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} D(m_{\max SPL}(x, y, z_0))dxdy$ is approximated as

$$\sum_{z \in Y} \sum_{x \in X} D(m_{\max SPL}(x, y, z_0))\Delta x \Delta y$$

where X,Y are defined as above.

This calculation must be repeated for each $z_0 \in Z$, to build the discrete function *f*(*z*).

With the calculation of *f*(*z*) complete, the integral of its product with $\rho(z)$ must be calculated to complete evaluation of

$$\int_{-\infty}^{\infty} \rho(z) \int_{-\infty-\infty}^{\infty\infty} D(m_{\max SPL}(x,y,z))dxdydz = \int_{-\infty}^{0} \rho(z) f(z) dz$$

Since *f*(*z*) is discrete, and $\rho(z)$ can be readily made discrete, this equation is approximated numerically as $\sum_{z \in Z} \rho(z) f(z)$, a dot product.

D.5.7 Preserving Calculations for Future Use

Calculating *f*(*z*) is the most time-consuming part of the numerical integration, but the most time-consuming portion of the entire process is calculating $m_{\max SPL}(x,y,z)$ over the area range required for the minimum cutoff value (120 dB). The calculations usually require propagation estimates out to over 100 km, and those estimates, with the beam pattern, are used to construct a sound field that extends 200 km × 200 km = 40,000 sq km, with a calculation at the steps for every value of *X* and *Y*, defined above. This is repeated for each depth, to a maximum of 2,000 meters.

Saving the entire $m_{\max SPL}$ for each *z* is unrealistic, requiring great amounts of time and disk space. Instead, the different levels in the range of $m_{\max SPL}$ are sorted into 0.5 dB wide bins; the volume of water at each bin level is taken from $m_{\max SPL}$, and associated with its bin. Saving this, the amount of water ensonified at each level, at a 0.5 dB resolution, preserves the ensonification information without using the space and time required to save $m_{\max SPL}$ itself. Practically, this is a histogram of occurrence of level at each depth, with 0.5 dB bins. Mathematically, this is simply defining the discrete functions $V_z(L)$, where $L = \{.5a\}$ for every positive integer *a*, and for all $z \in Z$. These functions, or histograms, are saved for future work. The information lost by saving only the histograms is *where* in space the different levels occur, although *how often* they occur is saved. But the thresholds (risk function curves) are purely a function of level, not location, so this information is sufficient to calculate *f*(*z*).

Applying the risk function to the histograms is a dot product:

$$\sum_{\ell \in L_1} D(\ell) V_{z_0}(\ell) \approx \int_{-\infty-\infty}^{\infty\infty} D(m_{\max SPL}(x,y,z_0))dxdy$$

So, once the histograms are saved, neither $m_{\max SPL}(x,y,z)$ nor *f*(*z*) must be recalculated to generate $\int_{-\infty}^{0} \rho(z) \int_{-\infty-\infty}^{\infty\infty} D(m_{\max SPL}(x,y,z))dxdydz$ for a new threshold function.

For the interested reader, the following section includes an in-depth discussion of the method, software, and other details of the *f*(*z*) calculation.

D.5.8 Software Detail

The risk-function metric uses the aforementioned Feller function to determine the probability that an animal is affected by a given sound pressure level. The acoustic quantity of interest is the maximum sound pressure level (SPL) experienced over multiple pings in a range-independent environment. The procedure for calculating the impact volume at a given depth is relatively simple. In brief, given the SPL of the source and the transmission loss (TL) curve, the received SPL is calculated on a volumetric grid. For a given depth, volume associated with each SPL interval is calculated. Then, this volume is multiplied by the probability that an animal will be affected by that sound pressure level. This gives the impact volume for that depth, which can be multiplied by the animal densities at that depth, to obtain the number of animals affected at that depth. The process repeats for each depth to construct the impact volume as a function of depth.

The case of a single emission of sound energy, one ping, illustrates the computational process in more detail. First, the sound pressure levels are segregated into a sequence of bins that cover the range encountered in the area. The SPL are used to define a volumetric grid of the local sound field. The impact volume for each depth is calculated as follows: for each depth in the volumetric grid, the SPL at each *xy*-plane grid point is calculated using the SPL of the source, the TL curve, the horizontal beam pattern of the source, and the vertical beam patterns of the source. The sound pressure levels in this grid become the bins in the volume histogram.

Figure D-14 shows an example volume histogram for a low-power source. Level bins are 0.5 dB in width and the depth is 50 meters in an environment with water depth of 100 meters. The oscillatory structure at very low levels is due to the flattening of the TL curve at long distances from the source, which magnifies the fluctuations of the TL as a function of range. The "expected" impact volume for a given level at a given depth is calculated by multiplying the volume in each level bin by the risk function evaluated at that level. Total expected impact volume for a given depth is the sum of these "expected" volumes.

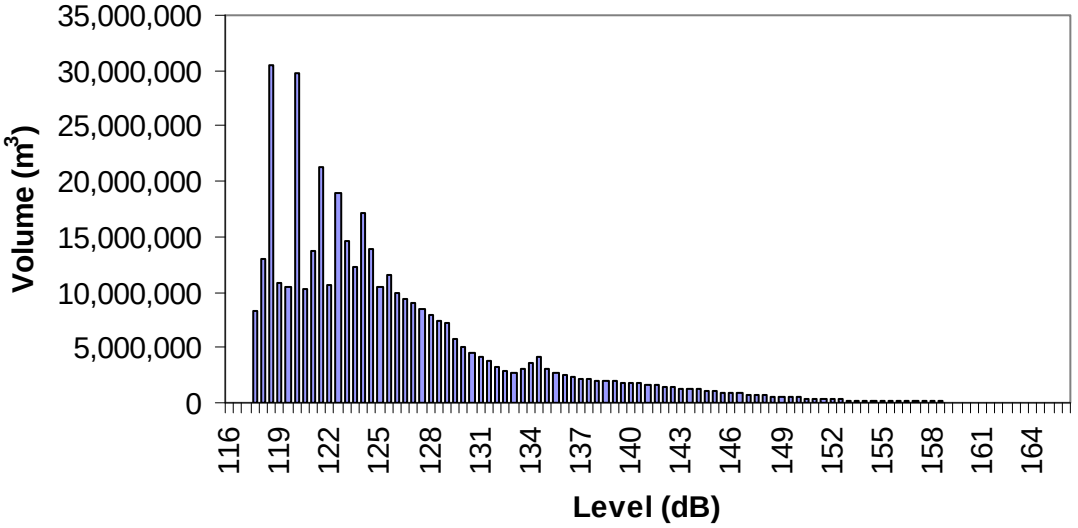


Figure D-14. Example of a Volume Histogram

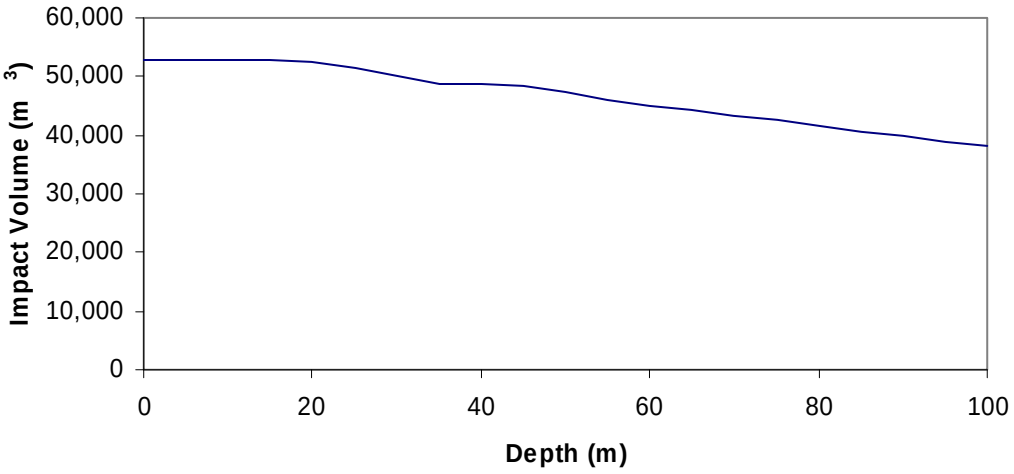


Figure D-15. Example of the Dependence of Impact Volume on Depth

The volumetric grid covers the waters in and around the area of a source's operation. The grid for this analysis has a uniform spacing of 5 meters in the *x*-coordinate and a slowly expanding spacing in the *y*-coordinate that starts with 5 meters spacing at the origin. The growth of the grid size along the *y*-axis is a geometric series where each successive grid size is obtained from the previous by multiplying it by 1 + *Ry*, where *Ry* is the *y*-axis growth factor. The n^{th} grid size is related to the first grid size by multiplying by $(1 + Ry)^{(n-1)}$. For an initial grid size of 5 meters and a growth factor of 0.005, the 100^{th} grid increment is 8.19 meters. The constant spacing in the *x*-coordinate allows greater accuracy as the source moves along the *x*-axis. The slowly increasing spacing in *y* reduces computation time, while maintaining accuracy, by taking advantage of the fact that TL changes more slowly at longer distances from the source. The *x*-and *y*-coordinates extend from $-R_{max}$ to $+R_{max}$, where R_{max} is the maximum range used in the TL calculations. The *z* direction uses a uniform spacing of 5 meters down to 1000 meters and 10 meters from 1000 to 2000 meters. This is the same depth mesh used for the effective energy metric as described above. The depth mesh does not extend below 2000 meters, on the assumption that animals of interest are not found below this depth.

The next three figures indicate how the accuracy of the calculation of impact volume depends on the parameters used to generate the mesh in the horizontal plane. Figure D-16 shows the relative change of impact volume for one ping as a function of the grid size used for the *x*-axis. The *y*-axis grid size is fixed at 5 m and the *y*-axis growth factor is 0, i.e., uniform spacing. The impact volume for a 5 meters grid size is the reference. For grid sizes between 2.5 and 7.5 meters, the change is less than 0.1%. A grid size of 5 meters for the *x*-axis is used in the calculations.

Figure D-17 shows the relative change of impact volume for one ping as a function of the grid size used for the x-axis and the *y*-axis grids, respectively. The *x*-axis grid size is fixed at 5 meters and the *y*-axis growth factor is 0. The impact volume for a 5 meters grid size is the reference. This figure is very similar to that for the *x*-axis grid size. For grid sizes between 2.5 and 7.5 meters, the change is less than 0.1%. A grid size of 5 meters is used for the *y*-axis in our calculations. Figure D-18 shows the relative change of impact volume for one ping as a function of the *y*-axis growth factor. The *x*-axis grid size is fixed at 5 meters and the initial *y*-axis grid size is 5 meters. The impact volume for a growth factor of 0 is the reference. For growth factors from 0 to 0.01, the change is less than 0.1%. A growth factor of 0.005 is used in the calculations.

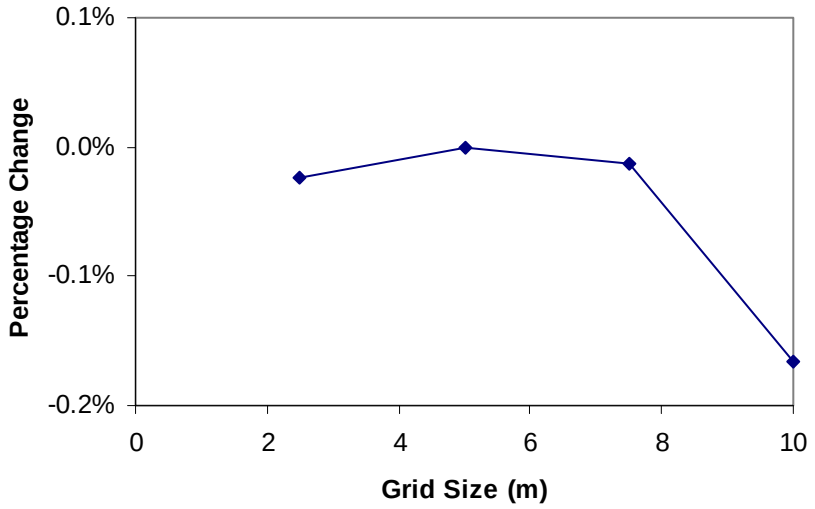


Figure D-16. Change of Impact Volume as a Function of *x*-axis Grid Size

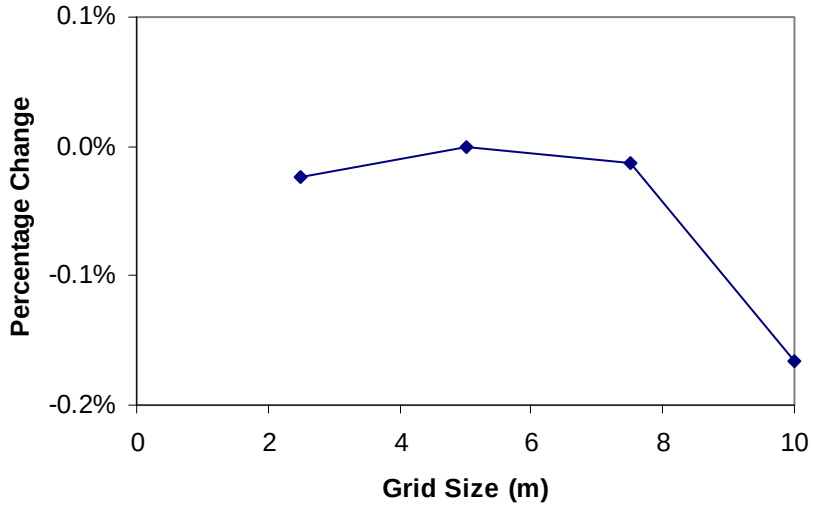


Figure D-17. Change of Impact Volume as a Function of y-axis Grid Size

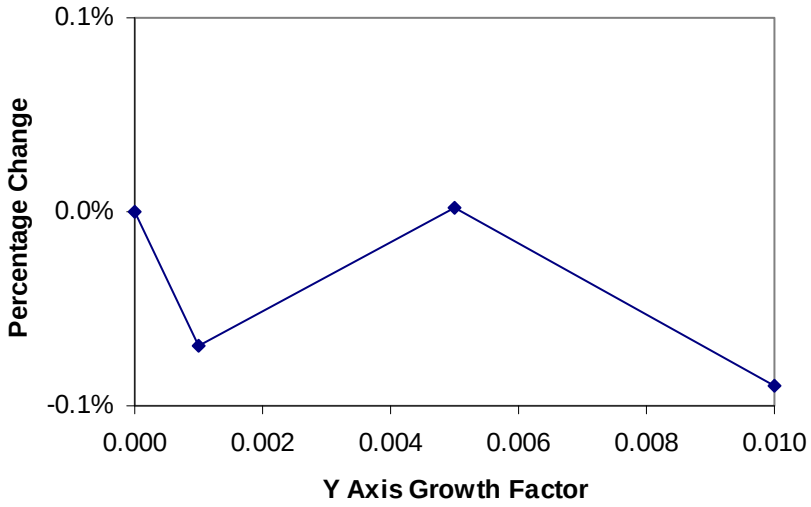


Figure D-18. Change of Impact Volume as a Function of y-axis Growth Factor

Another factor influencing the accuracy of the calculation of impact volumes is the size of the bins used for sound pressure level. The sound pressure level bins extend from 100 dB (far lower than required) up to 300 dB (much higher than that expected for any sonar system).

Figure D-19 shows the relative change of impact volume for one ping as a function of the bin width. The *x*-axis grid size is fixed at 5 meters, and the initial *y*-axis grid size is 5 meters with a *y*-axis growth factor of 0.005. The impact volume for a bin size of 0.5 dB is the reference. For bin widths from 0.25 dB to 1.00 dB, the change is about 0.1%. A bin width of 0.5 is used in our calculations.

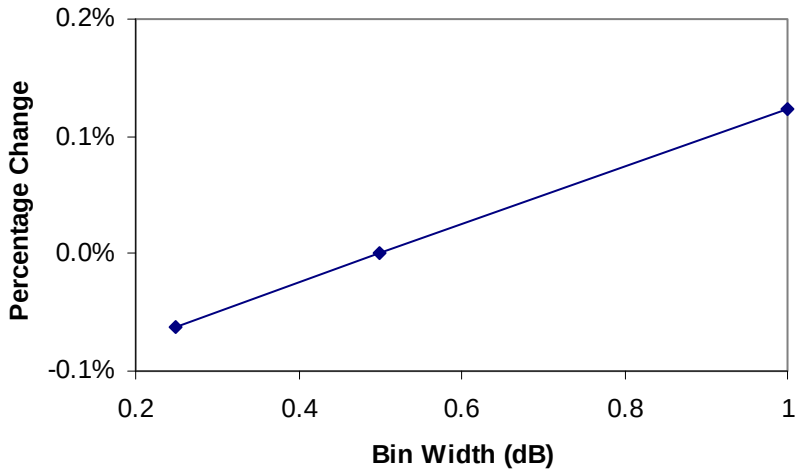


Figure D-19. Change of Impact Volume as a Function of Bin Width

Two other issues for discussion are the maximum range (R_{max}) and the spacing in range and depth used for calculating TL. The TL generated for the energy accumulation metric is used for dose-response analysis. The same sampling in range and depth is adequate for this metric because it requires a less

demanding computation (i.e., maximum value instead of accumulated energy). Using the same value of R_{max} needs some discussion since it is not clear that the same value can be used for both metrics. R_{max} was set so that the TL at R_{max} is more than needed to reach the energy accumulation threshold of 173 dB for 1000 pings. Since energy is accumulated, the same TL can be used for one ping with the source level increased by 30 dB (10 $\log_{10}(1000)$). Reducing the source level by 30 dB, to get back to its original value, permits the handling of a sound pressure level threshold down to 143 dB, comparable to the minimum required. Hence, the TL calculated to support energy accumulation for 1000 pings will also support calculation of impact volumes for the dose-response metric.

The process of obtaining the maximum sound pressure level at each grid point in the volumetric grid is straightforward. The active sonar starts at the origin and moves at constant speed along the positive *x*-axis emitting a burst of energy, a ping, at regularly spaced intervals. For each ping, the distance and horizontal angle connecting the source to each grid point is computed. Calculating the TL from the source to a grid point has several steps. The TL is made up of the sum of many eigenrays connecting the source to the grid point. The beam pattern of the source is applied to the eigenrays based on the angle at which they leave the source. After summing the vertically beamformed eigenrays on the range mesh used for the TL calculation, the vertically beamformed TL for the distance from the sonar to the grid point is derived by interpolation. Next, the horizontal beam pattern of the source is applied using the horizontal angle connecting the sonar to the grid point. To avoid problems in extrapolating TL, only grid points with distances less than R_{max} are used. To obtain the sound pressure level at a grid point, the sound pressure level of the source is reduced by that TL. For the first ping, the volumetric grid is populated by the calculated sound pressure level at each grid point. For the second ping and subsequent pings, the source location increments along the *x*-axis by the spacing between pings and the sound pressure level for each grid point is again calculated for the new source location. Since the risk-function metric uses the maximum of the sound pressure levels at each grid point, the newly calculated sound pressure level at each grid point is compared to the sound pressure level stored in the grid. If the new level is larger than the stored level, the value at that grid point is replaced by the new sound pressure level.

For each bin, a volume is determined by summing the ensonified volumes with a maximum SPL in the bin's interval. This forms the volume histogram shown in Figure D-14. Multiplying by the dose-response probability function for the level at the center of a bin gives the impact volume for that bin. The result can be seen in Figure D-15, which is an example of the impact volume as a function of depth.

The impact volume for a sonar moving relative to the animal population increases with each additional ping. The rate at which the impact volume increases for the risk function metric is essentially linear with the number of pings. Figure D-20 shows the dependence of impact volume on the number of pings. The slope of the line at a given depth is the impact volume added per ping. This number multiplied by the number of pings in an hour gives the hourly impact volume for the given depth increment. Completing this calculation for all depths in a province, for a given source, gives the hourly impact volume vector which contains the hourly impact volumes by depth for a province.

Figure D-21 provides an example of an hourly impact volume vector for a particular environment. Given the speed of the sonar platform, the hourly impact volume vector could be displayed as the impact volume vector per kilometer of track.

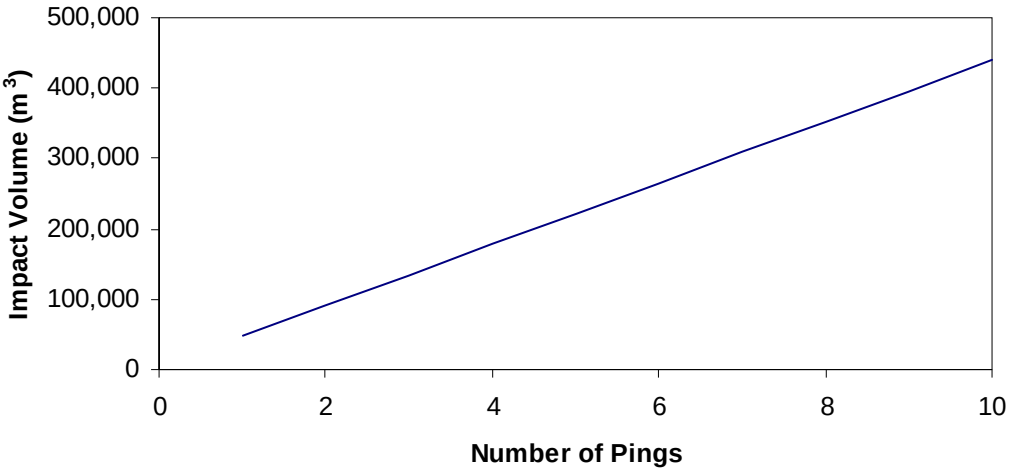


Figure D-20. Dependence of Impact Volume on the Number of Pings

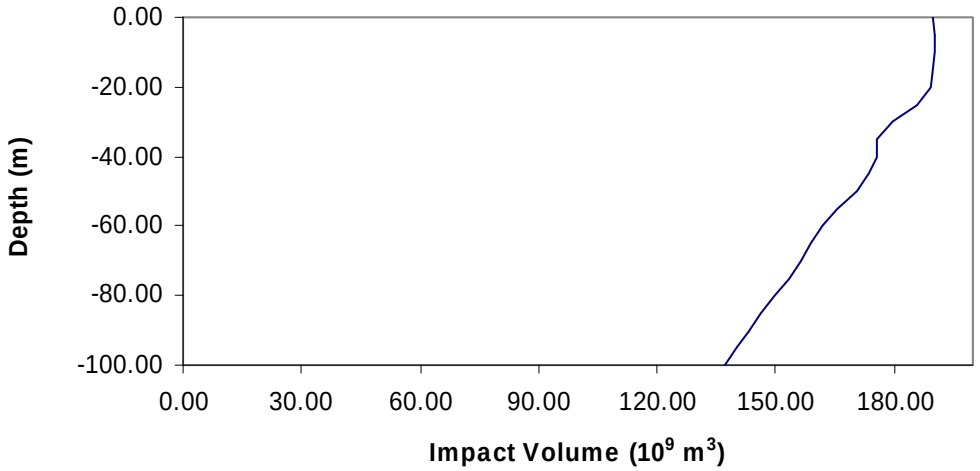


Figure D-21. Example of an Hourly Impact Volume Vector

D.5.9 Modeling Quiet and Continuous Sources

The TMAA has modeled sources whose energy contributions do not exceed EFDL thresholds, but have source levels above 120 dB, and move in a continuous fashion. The previous discussion of software detail would present under-sampling artifacts when applied to quiet sources, so an alternative approach is implemented.

Consider transmission loss with cylindrical symmetry surrounding an omni-directional source (Figure D-22):

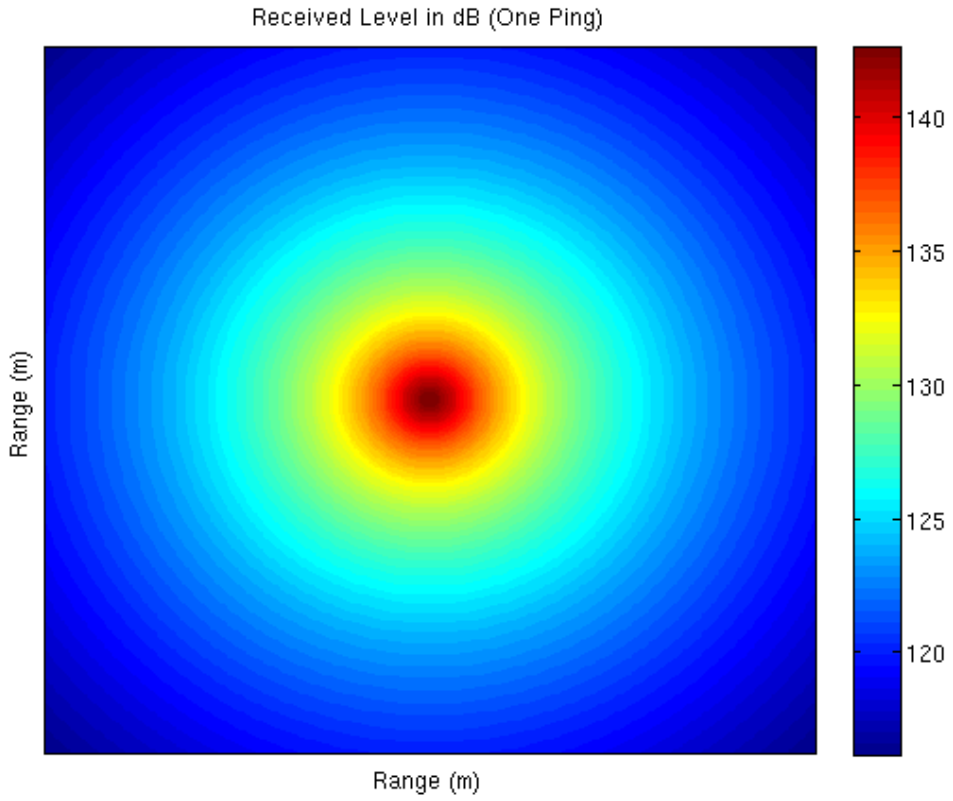


Figure D-22. – Single Ping Maximum SPL Field

When the factors of continuous pinging behavior, monotonic transmission loss in the short range, and maximum SPL as the input metric for the risk function, computing the maximum SPL field is a matter of extending the field as such (Figure D-23):

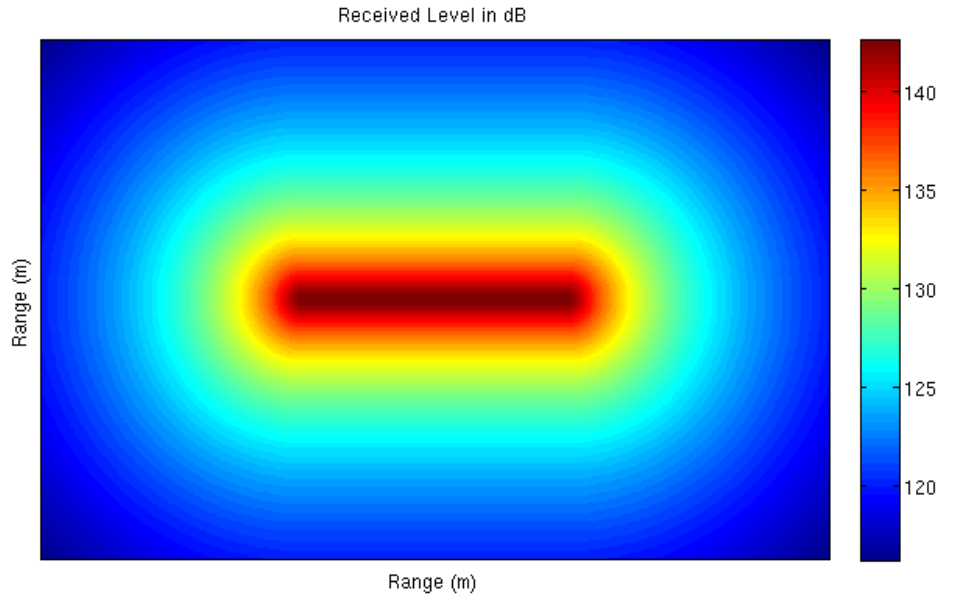


Figure D-23. – Quiet Continuous Sound Source

In the direction orthogonal to source motion, maximum SPL is achieved at CPA. This algorithm takes a 0.5-meter resolution frequency-dependent TL curve and proceeds as follows.

In a given depth interval:

- Find the received level in one meter increments about a source. In the first one meter step, calculate the area of circle ensonified at the matching received level.
- Calculate areas of subsequent n^{th} circles in 1 meter steps.
- Compute the area on a rectangular strip for a one-meter extent in parallel to annulus radius of equivalent received level. Scale by the probability of harassment based on received level at this n^{th} range. Note that received level at the outer-radius of the modified annulus was used to calculate the probability with the risk function.
- Convert annulus result to volume based on the depth increment.
- Sum all scaled volumes of interior cylinder and subsequent annuli to impact range at 120 dB to find a cumulative volume for this depth interval which inherits the probabilistic calculation.

This algorithm takes place over the entire water column to capture dynamics of ensonification over all depths, and hence produces an impact volume vector.

D.6 HARRASSMENTS

This section defines the animal densities and their depth distributions for the TMAA. This is followed by a series of tables providing MMPA harassment estimates per unit of operation for each source type (active sound sources and explosives).

D.6.1 Animal Densities

Densities are usually reported by marine biologists as animals per square kilometer, which is an area metric. This gives an estimate of the number of animals below the surface in a certain area, but does not provide any information about their distribution in depth. The impact volume vector (see subsection D.4.3) specifies the volume of water ensonified above the specified threshold in each depth interval. A corresponding animal density for each of those depth intervals is required to compute the expected value of the number of exposures. The two-dimensional area densities do not contain this information, so three-dimensional densities must be constructed by using animal depth distributions to extrapolate the density at each depth. The required depth distributions are presented in the biology subsection.

D.6.2 Harassment Estimates

The following sperm whale example demonstrates the methodology used to create a three-dimensional density by merging the area densities with the depth distributions. The sperm whale surface density is 0.0003 whales per square kilometer. From the depth distribution report, "depth distribution for sperm whales based on information in the Amano paper is: 31% in 0-10 m, 8% in 10-200 m, 9% in 201-400 m, 9% in 401-600 m, 9% in 601-800 m and 34% in >800 m." So the sperm whale density at 0-10 m is 0.0003*0.31/0.01 = 0.0093 per cubic km, at 10-200 m is 0.0003*0.08/0.19 = .00012632 per cubic km, and so forth.

In general, the impact volume vector samples depth in finer detail than given by the depth distribution data. When this is the case, the densities are apportioned uniformly over the appropriate intervals. For example, suppose the impact volume vector provides volumes for the intervals 0-10 meters, 10-50 meters, and 50-200 meters. Then for the depth-distributed densities discussed in the preceding paragraph,

- 0.0093 whales per cubic km is used for 0-10 meters,
- 0.00012632 whales per cubic km is used for the 10-50 meters, and
- 0.00012632 whales per cubic km is used for the 50-200 meters.

Once depth-varying, three-dimensional densities are specified for each species type, with the same depth intervals and the ensonified volume vector, the density calculations are finished. The expected number of ensonified animals within each depth interval is the ensonified volume at that interval multiplied by the volume density at that interval and this can be obtained as the dot product of the ensonified volume and animal density vectors.

Since the ensonified volume vector is the ensonified volume per unit operation (i.e. per hour, per sonobuoy, etc), the final harassment count for each animal is the unit operation harassment count multiplied by the number of units (hours, sonobuoys, etc).

D.6.3 Additional Modeling Considerations in a General Modeling Scenario

When modeling the effect of sound projectors in the water, the ideal task presents modelers with complete *a priori* knowledge of the location of the source(s) and transmission patterns during the times of interest. In these cases, calculation inputs include the details of source path, proximity of shoreline, high-resolution density estimates, and other details of the scenario. However, in the TMAA, there are sound-producing events for which the source locations and transmission patterns are unknown, but still require analysis to predict effects. For these cases, a more general modeling approach is required: "We will be operating somewhere in this large area for *X* minutes. What are the potential effects on average?"

Modeling these general scenarios requires a statistical approach to incorporate the scenario nuances into harassment calculations. For example, one may ask: "If an animal receives 130 dB SPL when the source passes at closest point of approach (CPA) on Tuesday morning, how do we know it doesn't receive a higher level on Tuesday afternoon?" This question cannot be answered without knowing the path of the source (and several other facts). Because the path of the source is unknown, the number of an individual's re-exposures cannot be calculated directly. But it can, on average, be accounted for by making appropriate assumptions.

Table D-14 lists unknowns created by uncertainty about the specifics of a future proposed action, the portion of the calculation to which they are relevant, and the assumption that allows the effect to be computed without the detailed information:

Table D-14 – Unknowns and Assumptions

Unknowns	Relevance	Assumption
Path of source (esp. with respect to animals)	Ambiguity of multiple exposures, Local population: upper bound of harassments	Most conservative case: sources can be anywhere within range
Source locations	Ambiguity of multiple exposures, land shadow	Equal distribution of action in each range
Direction of sonar transmission	Land shadow	Equal probability of pointing any direction

The following sections discuss two topics that require action details, and describe how the modeling calculations used the general knowledge and assumptions to overcome the future-action uncertainty with respect to re-exposure of animals, and land shadow.

D.6.4 Multiple Exposures in General Modeling Scenario

Consider the following hypothetical scenario. A box is painted on the surface of a well-studied ocean environment with well-known propagation. A sound source and 100 whales are inserted into that box and a curtain is drawn. What will happen? The details of what will happen behind the curtain are unknown, but the existing knowledge, and general assumptions, can allow for a calculation of average affects.

For the first period of time, the source is traveling in a straight line and pinging at a given rate. In this time, it is known how many animals, on average, receive their max SPLs from each ping. As long as the source travels in a straight line, this calculation is valid. However, after an undetermined amount of time, the source will change course to a new and unknown heading.

If the source changes direction 180 degrees and travels back through the same swath of water, all the animals the source passes at closest point of approach (CPA) before the next course change have already been exposed to what will be their maximum SPL, so the population is not "fresh." If the direction does not change, only new animals will receive what will be their maximum SPL from that source (though most have received sound from it), so the population is completely "fresh." Most source headings lead to a population of a mixed "freshness," varying by course direction. Since the route and position of the source over time are unknown, the freshness of the population at CPA with the source is unknown. This ambiguity continues through the remainder of the exercise.

What is known? The source and, in general, the animals remain in the vicinity of the range. Thus, if the farthest range to a possible effect from the source is *X* km, no animals farther than *X* km outside of the TMAA can be harassed. The intersection of this area with a given animal's habitat multiplied by the density of that animal in its habitat represents the maximum number of animals that can be harassed by activity in that TMAA, which shall be defined as "the local population." Two details: first, this maximum should be adjusted down if a risk function is being used, because not 100% of animals within *X* km of the TMAA border will be harassed. Second, it should be adjusted up to account for animal motion in and out of the area.

The ambiguity of population freshness throughout the exercise means that multiple exposures cannot be calculated for any individual animal. It must be dealt with generally at the population level.

D.6.4.1 Solution to the Ambiguity of Multiple Exposures in the General Modeling Scenario

At any given time, each member of the population has received a maximum SPL (possibly zero) that indicates the probability of harassment in the exercise. This probability indicates the contribution of that individual to the expected value of the number of harassments. For example, if an animal receives a level that indicates 50% probability of harassment, it contributes 0.5 to the sum of the expected number of harassments. If it is passed later with a higher level that indicates a 70% chance of harassment, its contribution increases to 0.7. If two animals receive a level that indicates 50% probability of harassment, they together contribute 1 to the sum of the expected number of harassments. That is, we statistically expect exactly one of them to be harassed. Let the expected value of harassments at a given time be defined as "the harassed population" and the difference between the local population (as defined above) and the harassed population be defined as "the unharassed population." As the exercise progresses, the harassed population will never decrease and the unharassed population will never increase.

The unharassed population represents the number of animals statistically "available" for harassment. Since we do not know where the source is, or where these animals are, we assume an average (uniform) distribution of the unharassed population over the area of interest. The densities of unharassed animals are lower than the total population density because some animals in the local population are in the harassed population.

Density relates linearly to expected harassments. If action A in an area with a density of 2 animals per square kilometer produces 100 expected harassments, then action A in an area with 1 animal per square kilometer produces 50 expected harassments. The modeling produces the number of expected harassments per ping starting with 100% of the population unharassed. The next ping will produce slightly fewer harassments because the pool of unharassed animals is slightly less.

For example, consider the case where 1 animal is harassed per ping when the local population is 100, 100% of which are initially unharassed. After the first ping, 99 animals are unharassed, so the number of animals harassed during the second ping are

$$1\left(\frac{99}{100}\right) = 1(.99) = 0.99 \text{ animals}$$

and so on for the subsequent pings.

Mathematics

A closed form function for this process can be derived as follows.

Define $H =$ number of animals harassed per ping with 100% unharassed population. H is calculated by determining the expected harassments for a source moving in a straight line for the duration of the exercise and dividing by the number of pings in the exercise (Figure D-24).

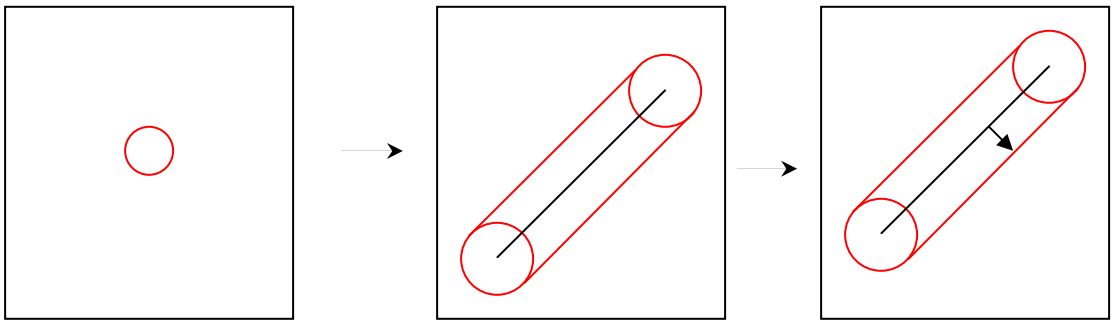


Figure D-24. – Process of calculating *H*

$$H = \frac{\int\int\int \rho(z) D(L(x,y,z)) dx dy dz}{N_{pings}}$$

The total un-harassed population is then calculated by iteration. Each ping affects the un-harassed population left after all previous pings:

Define $P_n =$ unharassed population after n^{th} ping

$$P_0 = \text{local population}$$

$$P_1 = P_0 - H$$

$$P_2 = P_1 - H\left(\frac{P_1}{P_0}\right)$$

...

$$P_n = P_{n-1} - H\left(\frac{P_{n-1}}{P_0}\right)$$

Therefore,

$$P_n = P_{n-1}\left(1 - \left(\frac{H}{P_0}\right)\right) = P_{n-2}\left(1 - \left(\frac{H}{P_0}\right)\right)^2 = \ldots = P_0\left(1 - \left(\frac{H}{P_0}\right)\right)^n$$

Thus, the total number of harassments depends on the per-ping harassment rate in an un-harassed population, the local population size, and the number of operation hours.

D.6.4.2 Local Population: Upper Bound on Harassments

As discussed above, Navy planners have confined periods of sonar use to operation areas. The size of the harassed population of animals for an action depends on animal re-exposure, so uncertainty about the precise source path creates variability in the "harassable" population. Confinement of sonar use to a sonar operating area allows modelers to compute an upper bound, or worst case, for the number of harassments with respect to location uncertainty. This is done by assuming that every animal which enters the operation area at any time in the exercise (and also many outside) is "harassable" and creates an upper bound on the number of harassments for the exercise. Since this is equivalent to assuming that there are sonars transmitting simultaneously from each point in the confined area throughout the action length, this greatly overestimates the harassments from an exercise.

NMFS has defined a twenty-four hour "refresh rate," or amount of time in which an individual animal can be harassed no more than once. The Navy has determined that, in a twenty-four hour period, all training events in the TMAA involve sources that transmit for no longer than sixteen (16) hours.

The most conservative assumption for a single ping is that it harasses the entire population within the range (a gross over-estimate). However, the total harassable population for multiple pings will be even greater since animal motion over the period in the above table can bring animals into range that otherwise would be out of the harassable population.

D.6.4.3 Animal Motion Expansion

Though animals often change course to swim in different directions, straight-line animal motion would bring the more animals into the harassment area than a "random walk" motion model. Since precise and accurate animal motion models exist more as speculation than documented fact and because the modeling requires an undisputable upper bound, calculation of the upper bound for TMAA modeling areas uses a straight-line animal motion assumption. This is a conservative assumption.

For a circular area, the straight-line motion in any direction produces the same increase in harassable population. However, since the ranges are non-circular polygons, choosing the initial fixed direction as perpendicular to the longest diagonal produces greater results than any other direction. Thus, the product of the longest diagonal and the distance the animals move in the period of interest gives an overestimate

of the expansion in range modeling areas due to animal motion. The expansions use this estimate as an absolute upper bound on animal-motion expansion.

Figure D-25 illustrates the overestimation, which occurs during the second arrow:

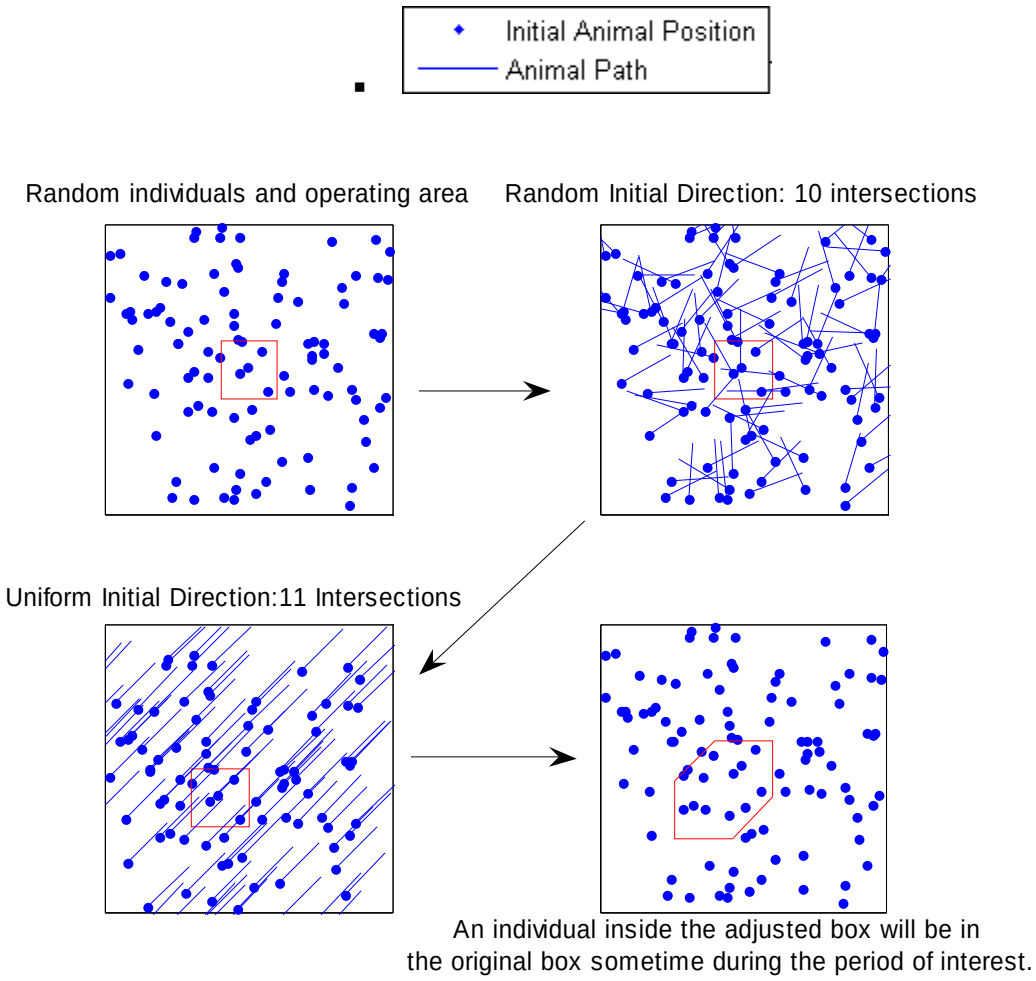


Figure D-25. Process of Setting an Upper Bound on Individuals Present in Area

It is important to recognize that the area used to calculate the harassable population, shown in Figure D-25 will, in general, be much larger than the area that will be within the ZOI of a ship for the duration of its broadcasts. For a ship moving faster than the speed of the marine animals, a better (and much smaller) estimate of the harassable population would be that within the straight line ZOI cylinder shown in Figure D-26. Using this smaller population would lead to a greater dilution of the unharassed population per ping and would greatly reduce the estimated harassments.

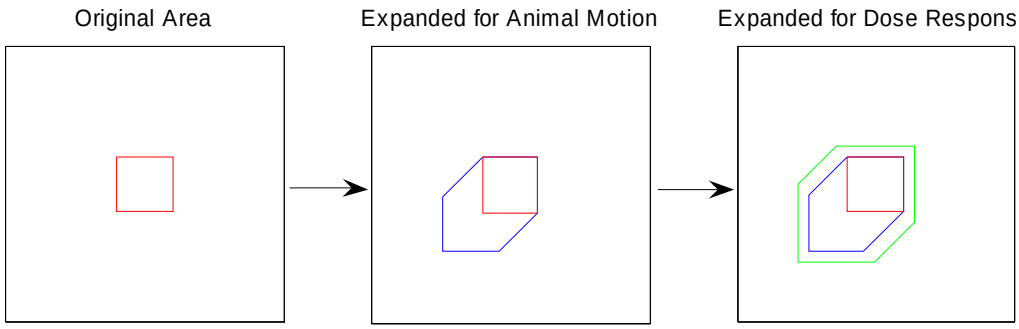


Figure D-26. Process of Expanding Area to Create Upper Bound of Harassments

D.6.4.4 Risk Function Expansion

The expanded area contains the number of animals that will enter the range over the period of interest. However, an upper bound on harassments must also include animals outside the area that would be affected by a source transmitting from the area's edge. A gross overestimation could simply assume pinging at every point on the range border throughout the exercise and would include all area with levels from a source on the closest border point greater than the risk function basement. In the case of GOA, this would include all area within approximately 105 km from the edge of the adjusted box. (See Table D-15). This basic method would give a crude and exaggerated upper bound, since only a tiny fraction of this out-of-range area can be ensonified above threshold for a given ping. A more refined upper bound on harassments can be found by maintaining the assumption that a source is transmitting from each point in the adjusted box and calculating the expected ensonified area, which would give all animals inside the area a 100% probability of harassment, and those outside the area a varying probability, based on the risk function.

$$\int_0^{L^{-1}(120\,dB)} D(L(r))dr\,,$$

Where L is the SPL function with domain in range and range in level,

r is the range from the sonar operating area,

$L^{-1}(120\text{ dB})$ is the range at which the received level drops to 120 dB, and

D is the risk function (probability of harassment vs. Level).

At the corners of the polygon, additional area can be expressed as

$$\frac{[\pi-\theta]\int_0^{L^{-1}(120\,dB)} D(L(r))rdr}{2\pi}$$

with D, L, and r as above, and

θ the inner angle of the polygon corner, in radians.

For the risk function and transmission loss of the TMAA, this method adds an area equivalent by expanding the boundaries of the adjusted box by four kilometers. The resulting shape, the adjusted box with a boundary expansion of 4 km, does not possess special meaning for the problem. But the number of individuals contained by that shape, is the harassable population and an absolute upper bound on possible harassments for that operation.

The following plots illustrate the growth of area for the sample case above. The shapes of the boxes are unimportant. The area after the final expansion, though, gives an upper bound on the "harassable", or initially unharassed population which could be affected by operations.

Example Case

Consider a sample case from the TMAA. For the most powerful source, the SQS-53, the expected winter rate of exposures under the risk function considered behaviorial MMPA Level B harassment for minke whales is approximately 0.068985832 harassments per ping. The exercise will transmit sonar pings for 16 hours in a 24 hour period as consistent with planned use, with 120 pings per minute, a total of 120 * 16 = 1,920 pings in a 24 hour period.

The TMAA has an area of approximately 92,246 square kilometers and a diagonal of 486.5 km. Adjusting this with straight-line (upper bound) animal motion of 5.5 kilometers per hour for 16 hours, animal motion adds 486.5 * 5.5 * 16 = 42,812 square kilometers to the area. Using the risk function to calculate the expected range outside the OA approximately adds another 5,068 square kilometers, bringing the total upper-bound of the affected area to 140,126 square km.

For example, minke whales have an average winter density of 0.0006 animals per square kilometer, so the upper bound number of minke whales that can be affected by SQS-53 activity in the GOA during a 24 hour period is 140,126 * 0.0006 = 84.0756 whales.

In the first ping, 0.068985832 minke whales will be harassed. With the second ping,

$0.068985832 \left(\frac{84.0756 - 0.068985832}{84.0756} \right) = 0.068929228$ minke whales will be harassed. Using the formula derived above, after 16 hours of continuous operation, the remaining **unharassed** population is

$$P_{1920} = P_0 \left(1 - \left(\frac{h}{P_0} \right) \right)^{1920} = 84.0756 \left(1 - \left(\frac{0.068985832}{84.0756} \right) \right)^{1920} \approx 17.3861$$

So the **harassed** population will be 84.0756 – 17.3861 = 66.6895 animals.

Contrast this with linear accumulation of harassments without consideration of the local population and the dilution of the unharassed population:

Harassments = 0.068985832 * 1920 = 132.45 whales,

which is 57% greater than the estimated local population of 84.0756 minke whales. Because linear accumulation assumes an infinite local population, it always overestimates the number of harassments, sometimes to the point of producing impossible results.

D.6.5 Land Shadow

The risk function considers the possibility of harassment possible if an animal receives 120 dB sound pressure level, or above. In the open ocean of the GOA, this can occur as far away as 105 km, so over a large "effect" area, sonar sound could, but does not necessarily, harass an animal. The harassment calculations for a general modeling case must assume that this effect area covers only water fully populated with animals, but in some portions of the GOA, land partially encroaches on the area, obstructing sound propagation.

As discussed in the introduction of "Additional Modeling Considerations" Navy planners do not know the exact location and transmission direction of the sonars at future times. These factors however, completely determine the interference of the land with the sound, or "land shadow," so a general modeling approach does not have enough information to compute the land shadow effects directly. However, modelers can predict the reduction in harassments at any point due to land shadow for different pointing directions and use expected probability distribution of activity to calculate the average land shadow for operations in each range.

For each of the coastal points that are within 105 km of the grid, the azimuth and distance are computed. In the computation, only the minimum range at each azimuth is computed.

Now, the average of the distances to shore, along with the angular profile of land is computed (by summing the unique azimuths that intersect the coast) for each grid point. The values are then used to compute the land shadow for the grid points.

D.6.5.1 Computing the Land Shadow Effect at Each Grid Point

The effect of land shadow is computed by determining the levels, and thus the distances from the sources, that the harassments occur. The levels vary according to acoustic propagation conditions, so the analysis breaks down according to two seasons. Table D-15 gives a mathematical extrapolation of the distances and levels at which harassments occur, with average seasonal propagation in the GOA using the SQS-53 as an example and as displayed in Figures D-27 and D-28.

Table D-15 – Behavioral Harassments at each Received Level Band from SQS-53 During Summer Months

Received Level (dB SPL)	Distance at which Levels Occur in GOA	Percent of Behavioral Harassments Occurring at Given Levels
Below 138	42 km – 105 km	~ 0 %
138<Level<144	28 km – 42 km	< 1 %
144<Level<150	17 km – 28 km	~1 %
150<Level<156	9 km – 17 km	7 %
156<Level<162	5 km – 9 km	18 %
162<Level<168	2.5 km – 5 km	26 %
168<Level<174	1.2 km – 2.5 km	22 %
174<Level<180	0.5 km – 1.2 km	14 %
180<Level<186	335 m – 0.5 km	6 %
186<Level<TTS	178 m – 335 m	5 %

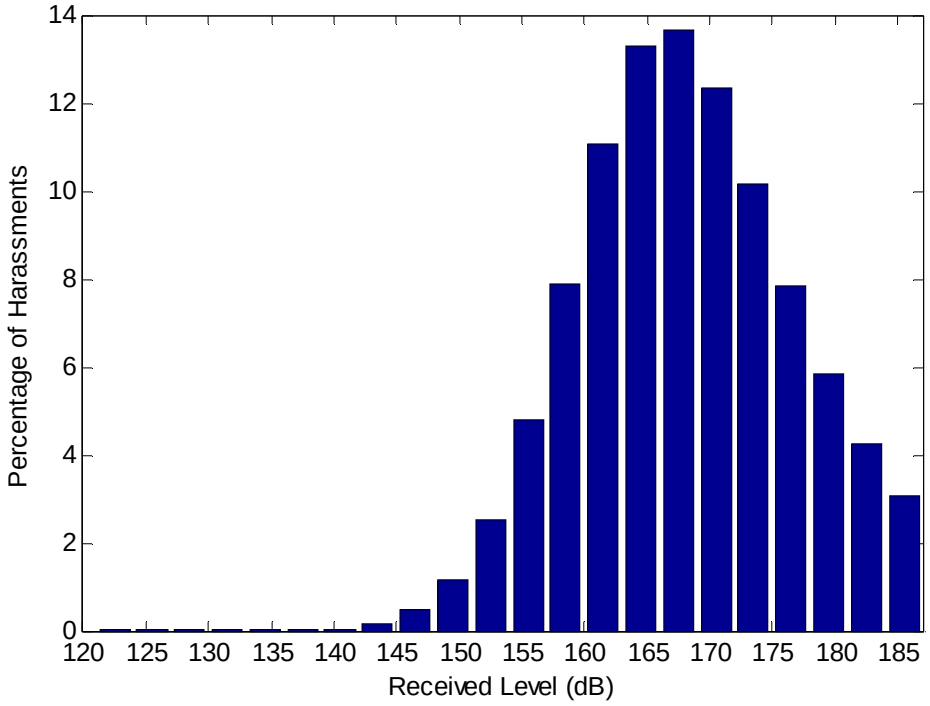


Figure D-27. – The Approximate Percentage of Behavioral Harassments for Every 3 Degree Band of Received Level from the SQS-53 During Summer Months

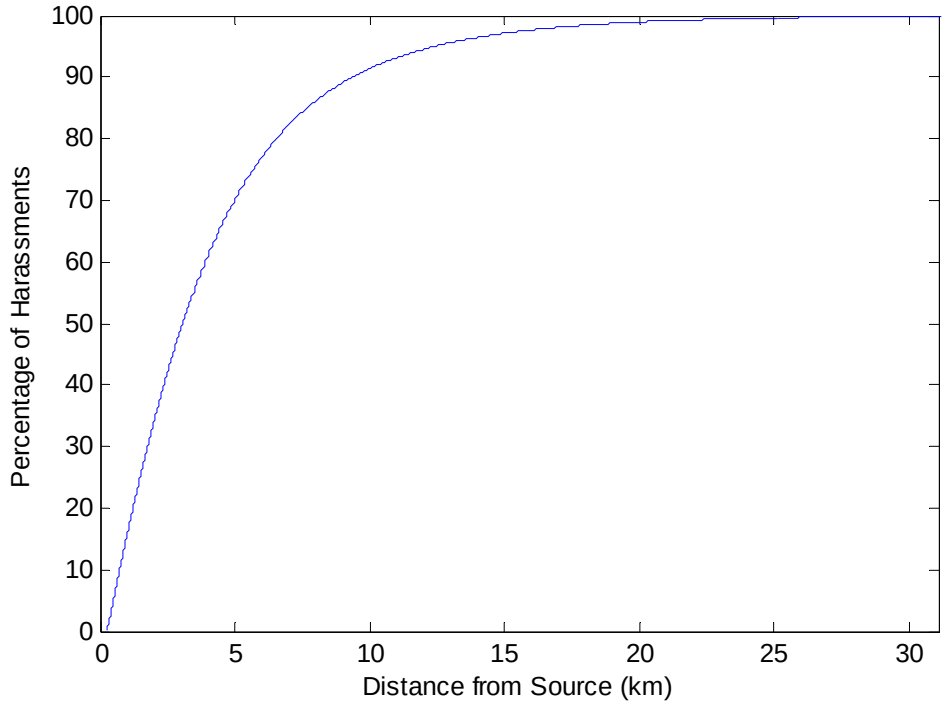


Figure D-28. – Average Percentage of Harassments Occurring Within a Given Distance during Summer Months

With the data used to produce the previous figure, the average effect reduction during summer months for a sound path blocked by land can be calculated. For the SQS-53, since approximately 92% of harassments occur within 10 km of the source, a sound path blocked by land at 10 km will, on average, cause approximately 92% of the effect of an unblocked path.

As described above, the mapping process determines the angular profile of and distance to the coastline(s) from each grid point. The distance, then, determines the reduction due to land shadow when the sonar is pointed in that direction. The angular profile, then, determines the probability that the sonar is pointed at the coast.

Define θ_n = angular profile of coastline at point n in radians

Define r_n = mean distance to shoreline

Define $A(r)$ = average effect adjustment factor for sound blocked at distance r

The land shadow at point n can be approximated by $A(r_n)\theta_n/(2\pi)$. For illustration, the following plot gives the land shadow reduction factor at each point in each range area for the SQS-53 (Figure D-29) . The white portions of the plot indicate the areas outside the range and the blue lines indicate the coastline. The color plots inside the ranges give the land shadow factor at each point. The average land shadow factor for the SQS-53 in the GOA is essentially 1, or the reduction in effect is 0% for both seasons. For the other, lower-power sources it follows that this reduction is also negligible.

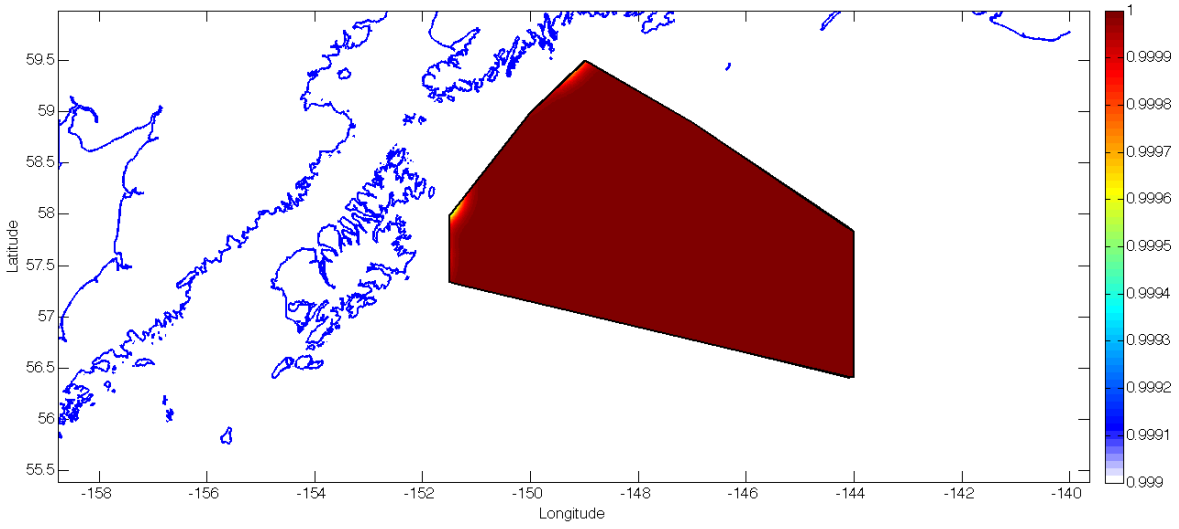


Figure D-29. – Depiction of Land Shadow over the TMAA

D.6.5.2 The Effect of Multiple Ships

Behavioral harassment, under dose response (risk function), uses maximum sound pressure level over a 24 hour period as the metric for determining the probability of harassment. An animal that receives sound from two sonars, operating simultaneously, receives its maximum sound pressure level from one of the ships. Thus, the effects of the louder, or closer, sonar determine the probability of harassment, and the more distant sonar does not. If the distant sonar operated by itself, it would create a lesser effect on the animal, but in the presence of a more dominating sound, its effects are cancelled. When two sources are sufficiently close together, their sound fields within the cutoff range will partially overlap and the larger

of the two sound fields at each point in that overlap cancel the weaker. If the distance between sources is twice as large as the range to cutoff, there will be no overlap.

Computation of the overlap between sound fields requires the precise locations and number of the source ships. The general modeling scenarios of the TMAA do not have these parameters, so the effect was modeled using an average ship distance, 20 km, and an average number of ships per exercise, in this case three ships.

The formation of ships in any of the above exercised has been determined by Navy planners. The ships are located in a straight line, perpendicular to the direction has traveled. The figures below (D-30 to D-34) show examples with four ships, and their ship tracks.

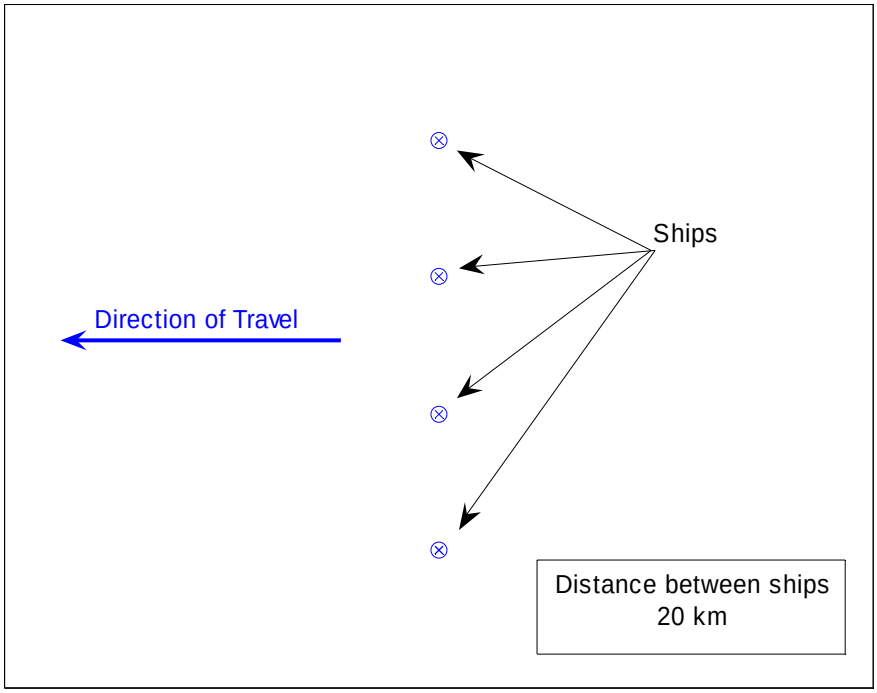


Figure D-30. – Formation and Bearing of Ships in 4-Ship Example

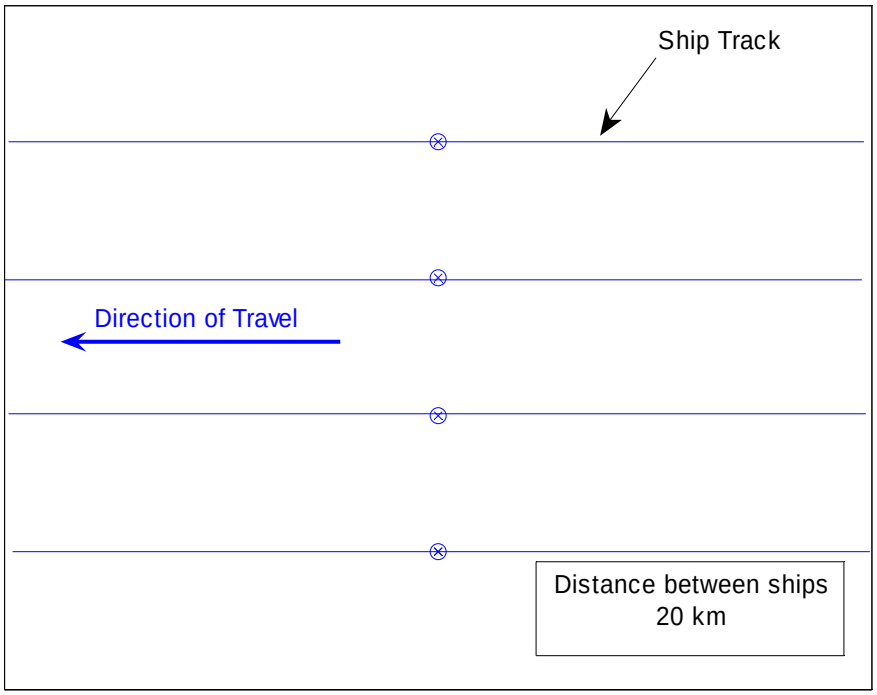


Figure D-31. – Ship Tracks of Ships in 4-Ship Example

The sound field created by these ships, which transmit sonar continually as they travel will be uniform in the direction of travel (or the "*x*" direction), and vary by distance from the ship track in the direction perpendicular to the direction of travel (or the "*y*" direction).

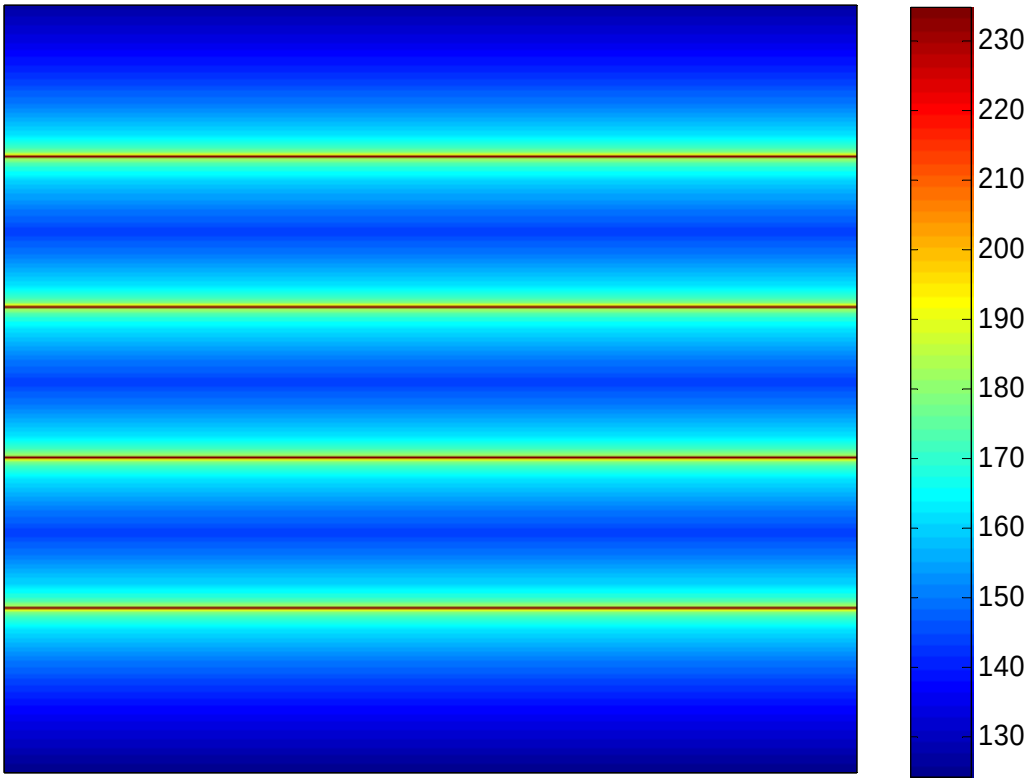


Figure D-32. – Sound Field Produced by Multiple Ships

This sound field of the four ships operating together (Figure D-32) ensonifies less area than four ships operating individually. However, because at the time of modeling, even the average number of ships and mean distances between them were unknown, a post-calculation correction should be applied.

As shown on Figure D-32, the sound field around the ship tracks, the portion above the upper-most ship track, and the portion below the lower-most ship track sum to produce exactly the sound field as an individual ship (Figure D-33).

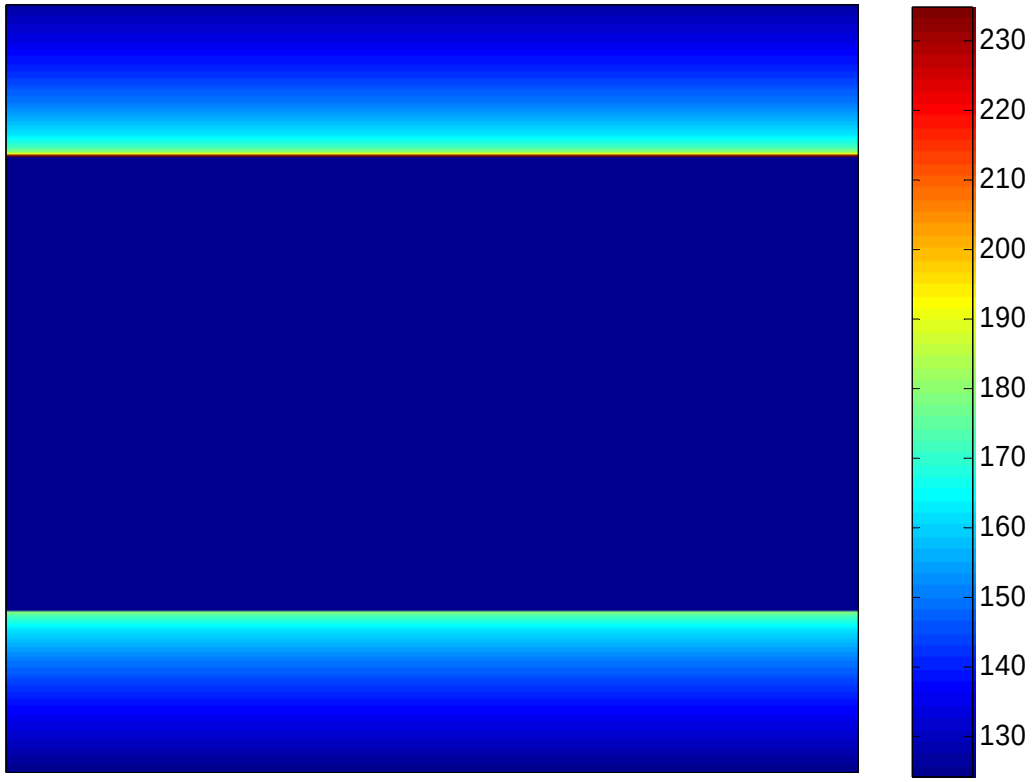


Figure D-33. – Upper and Lower Portion of Sound Field

Therefore, the remaining portion of the sound field, between the uppermost ship track and the lowermost ship track, is the contribution of the three additional ships (Figure D-34).

This remaining sound field is made up of three bands. Each of the three additional ships contributes one band to the sound field. Each band is somewhat less than the contribution of the individual ship because its sound is overcome by the nearer source at the center of the band. Since each ship maintains 20 km distance between it and the next, the height of these bands is 20 km, and the sound from each side projects 10 km before it is overcome by the source on the other side of the band. Thus, the contribution to a sound field for an additional ship is identical to that produced by an individual ship whose sound path is obstructed at 10 km. The work in the previous discussion on land shadow provides a calculation of effect reduction for obstructed sound at each range. An SQS-53-transmitting ship with obstructed signal at 10 kilometers across both seasons causes an average of 95% of the number of harassments as a ship with an unobstructed signal. Therefore, each additional ship causes 0.95 times the harassments of the individual ship. Applying this single-ship factor to the exercise type described earlier (three ships), the adjustment factor given this formation is approximately 2.90.

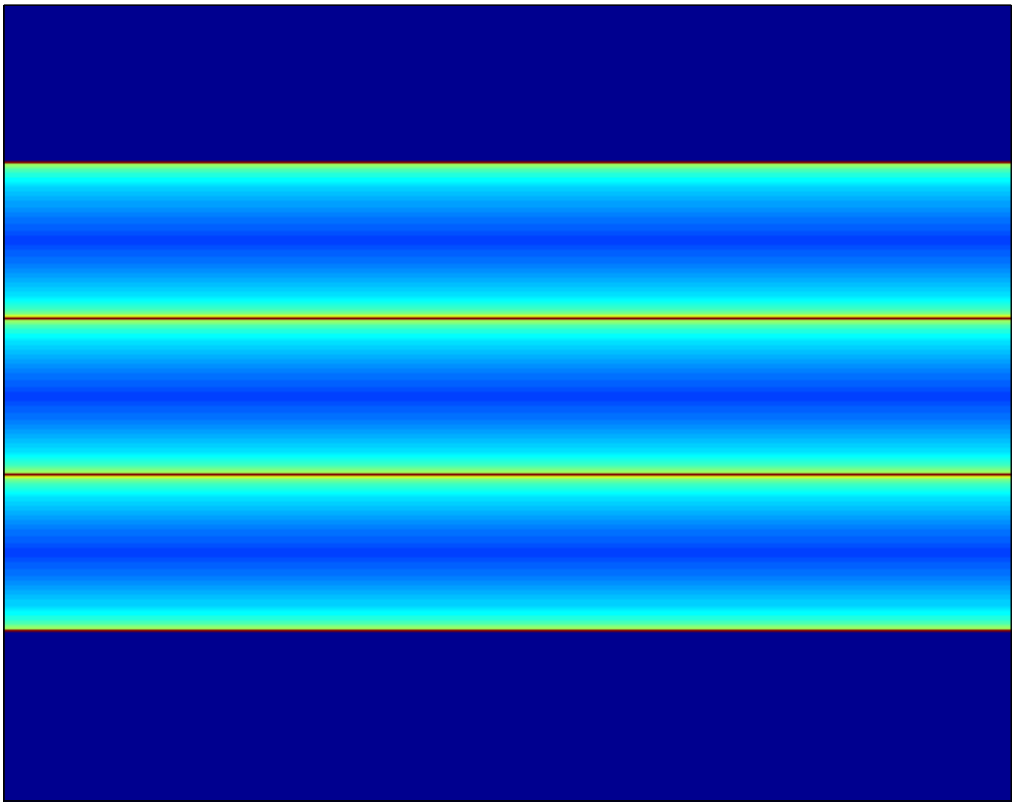


Figure D-34.– Central Portion of Sound Field

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Appendix E

Marine Mammal Density Report

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E MARINE MAMMAL DENSITY AND DEPTH DISTRIBUTION

E.1 BACKGROUND AND OVERVIEW

Marine mammal species occurring in the Gulf of Alaska (GOA) and the GOA Temporary Maritime Activities Area (TMAA) include baleen whales (mysticetes), toothed whales (odontocetes), and seals and sea lions (commonly referred to as pinnipeds). Baleen and toothed whales, collectively known as cetaceans, spend their entire lives in the water and spend most of the time (>90% for most species) entirely submerged below the surface. When at the surface, cetacean bodies are almost entirely below the water's surface, with only the blowhole exposed to allow breathing. This makes cetaceans difficult to locate visually and also exposes them to underwater noise, both natural and anthropogenic, essentially 100% of the time because their ears are nearly always below the water's surface. Seals and sea lions (pinnipeds) spend significant amounts of time out of the water during breeding, molting and hauling out periods. In the water, pinnipeds spend varying amounts of time underwater, as some species regularly undertake long, deep dives (e.g., elephant seals) and others are known to rest at the surface in large groups for long amounts of time (e.g., California sea lions). When not actively diving, pinnipeds at the surface often orient their bodies vertically in the water column and often hold their heads above the water surface. Consequently, pinnipeds may not be exposed to underwater sounds to the same extent as cetaceans.

For the purposes of this analysis, we have adopted a conservative approach to underwater noise and marine mammals:

- Cetaceans – assume 100% of time is spent underwater and therefore exposed to noise
- Pinnipeds – adjust densities to account for time periods spent at breeding areas, haulouts, etc.; but for those animals in the water, assume 100% of time is spent underwater and therefore exposed to noise.

E.1.1 Density

Mysticetes regularly occurring in the GOA include fin, minke, humpback and gray whales; blue and North Pacific right whales have been sighted in the GOA, but are considered rare and are included here only for discussion purposes because both are endangered species. Odontocetes regularly occurring include sperm whale, Cuvier's and Baird's beaked whales, killer whale, Pacific white-sided dolphin and Dall's porpoise. Belugas are occasionally sighted in the GOA, but most sightings are in coastal areas and their occurrence in the region is extremely low. Pinnipeds regularly occurring include Steller's sea lion, northern fur seal and northern elephant seal. California sea lion range extends as far north as the Pribilof Islands in the Bering Sea but their occurrence is likely rare.

Recent survey data for marine mammals in the GOA is limited. Most survey efforts are localized and extremely near shore. There is evidence of occurrence of several species based on acoustic studies, but these do not provide measurements of abundance. Best available density data were incorporated from several different sources which are described below and summarized in Table 1.

Fin and Humpback Whales

The Gulf of Alaska Line-Transect Survey (GOALS) was conducted in April 2009 (Rone et al., 2009) in the TMAA. Line-transect visual data and acoustic data were collected over a 10-day period, which resulted in sightings of several odontocete and mysticete species. Densities were derived for fin and humpback whales for inshore and offshore strata (Table 9 in Rone et al., 2009). Densities from each stratum were weighted by the percentage of stratum area compared to the TMAA: inshore stratum was 33% of the total area and offshore stratum was 67% of the total area.

Killer Whale

Vessel surveys were conducted in nearshore areas (within 85 km) of the TMAA in 2001-2003 (Zerbini et al., 2006), between Resurrection Bay on the Kenai Peninsula to Amchitka Island in the Aleutians. Densities were calculated for fin, humpback and killer whales; only those for killer whales are included here (Table 1) because more recent densities for fin and humpback whales are available from Rone et al. (2009). Killer whale densities are from "Block 1" in Zerbini et al. (2006).

Minke, Sperm and Beaked Whales, Pacific White-sided Dolphin and Dall's Porpoise

Waite (2003) conducted vessel surveys for cetaceans near Kenai Peninsula, within Prince William Sound and around Kodiak Island, during acoustic-trawl surveys for pollock in summer 2003. Surveys extended offshore to the 1000 m contour and therefore overlapped with some of the TMAA. Waite (2003) did not calculate densities, but did provide some of the elements necessary for calculating density.

Barlow (2003) provided the following equation for calculating density:

$$\text{Density/km}^2 = \frac{(n)\,(s)\,(f_0)}{(2L)\,(g_0)}$$

Where (n) = number of animal group sightings on effort

(s) = mean group size

f(0) = sighting probability density at zero perpendicular distance (influenced by species detectability and sighting cues such as body size, blows and number of animals in a group)

(L) = transect length completed (km)

g(0) = probability of seeing a group directly on trackline (influenced by perception bias and availability bias)

Three values, n, s, and L, were provided by Waite (2003). Values for f(0) and g(0) were not provided, and were instead assigned based on values from the literature for other vessel survey efforts in the North Pacific (Table 2). Using values calculated from other vessel survey efforts is acceptable in this situation because the correction factors were calculated from vessel surveys that were conducted similarly to the GOA effort. Specifically, factors such as number of observers (three), height of the flying bridge from the water's surface (12 m), ship's speed (11 kts), number of "Bigeyes" binoculars used (two), and acceptable sea state conditions (up to B05) during the GOA survey effort were all comparable to those used during NMFS survey efforts along the west coast of the US, in Hawaii and in the eastern tropical Pacific (see Table 2). Values for f(0) and g(0) are very similar per species between efforts, therefore the most conservative value was adopted for each species and applied to the density calculation.

Table 3 illustrates how the data from Waite (2003) were used to calculate densities using correction factors from Table 2. There are no variances attached to any of the resulting density values, so overall confidence in these values is unknown. Densities based on only one or two sightings generally have fairly high variance.

Gray whales

Gray whale density was calculated from data obtained from a feeding study near Kodiak Island (Moore et al. (2007).

Steller Sea Lion, Northern Fur Seal and Northern Elephant Seal

Pinniped at-sea density is not often available because pinniped abundance is obtained via shore counts of animals at known rookeries and haulouts. Therefore, densities of pinnipeds were derived quite differently from those of cetaceans. Several parameters were identified from the literature, including area of stock occurrence, number of animals (which may vary seasonally) and season, and those parameters were then used to calculate density. Once density per "pinniped season" was determined, those values were prorated to fit the warm water (June-October) and cold water (November-May) seasons. Determining density in this manner is risky as the parameters used usually contain error (e.g., geographic range is not exactly known and needs to be estimated, abundance estimates usually have large variances) and, as is true of all density estimates, it assumes that animals are always distributed evenly within an area which is likely never true. However, this remains one of the few means available to determine at-sea density for pinnipeds.

The Marine Resource Assessment for the Gulf of Alaska Operating Area (Department of the Navy, 2006), listed six mysticetes, twelve odontocetes, and five pinnipeds as occurring or possibly occurring in the GOA region (Department of the Navy, 2006; Table 3-1). However, several of the species listed are rare and do not regularly occur. Brief species summaries are included for all marine mammals whose distribution extends to the GOA, even if rarely seen, and additional information on all species can be found in the Marine Resources Assessment referenced above.

Table E-1. Marine mammals in the Gulf of Alaska; densities and season(s) included for species regularly seen.

Common Name	Scientific Name	Status	Density/km2 within TMAA	Season	Source
MYSTICETES					
Blue whale	*Balaenoptera musculus*	Endangered	-		
Fin whale	*B. physalus*	Endangered	0.010	Year round	Rone et al. (2009)
Sei whale	*B. borealis*	Endangered	-		
Minke whale	*B. acutorostrata*		0.0006	Year round	Waite (2003)
Humpback whale	*Megaptera novaeangliae*	Endangered	0.0019	Apr-Dec	Rone et al. (2009)
			-	Jan-Mar	Reeves et al. (2002)
North Pacific right whale	*Eubalaena japonica*	Endangered	-		
Gray whale	*Eschrichtius robustus*		0.0003	Year round	Moore et al. (2007)
ODONTOCETES					
Sperm whale	*Physeter catodon*	Endangered	0.0003	Year round	Waite (2003); Mellinger et al. (2004a)
Cuvier's beaked whale	*Ziphius cavirostris*		0.0022	Year round	Waite (2003)
Baird's beaked whale	*Berardius bairdii*		0.0005	Year round	Waite (2003)
Stejneger's beaked whale	*Mesoplodon stejnegeri*		-		
Killer whale	*Orcinus orca*		0.0100	Year round	Zerbini et al. (2007)
Beluga	*Delphinapterus leucas*		-		
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*		0.0208	Year round	Waite (2003)
Northern right whale dolphin	*Lissodelphis borealis*		-		
Risso's dolphin	*Grampus griseus*		-		
False killer whale	*Pseudorca crassidens*		-		
Short-finned pilot whale	*Globicephala macrorhynchus*		-		
Dall's porpoise	*Phocoenoides dalli*		0.1892	Year round	Waite (2003)
Harbor porpoise	*Phocoena phocoena*		-		
PINNIPEDS					
Steller's sea lion	*Eumetopias jubatus*	Endangered/ Threatened	0.0098	Year round	Angliss and Allen (2009); Bonnell and Bowlby (1992)
California sea lion	*Zalophus californianus*		-		
Harbor seal	*Phoca vitulina*		-		
Northern fur seal	*Callorhinus ursinus*		0.1180	June-October	Carretta et al., 2009
Northern elephant seal	*Mirounga angustirostris*		0.0022	June-October	Carretta et al., 2009

Table E-2. Comparison of f(0) and g(0) values, for species being considered from Waite (2003) from survey efforts outside of the TMAA.

Reference	Barlow (2003)		Ferguson and Barlow (2001)		Forney (2007)		Barlow and Forney (2007)		Barlow (2006)		Wade and Gerrodette (1993)
Species	f_0	g_0	f_0	g_0	f_0	g_0	f_0	g_0	f_0	g_0	f_0
Minke whale	**0.567**	**0.84**	0.362	0.84	0.38	0.856	0.46	0.856			
Sperm whale	0.217	**0.87**	**0.462**	0.87	0.36	0.87	0.34	0.87	0.27	0.87	0.14
Baird's beaked whale	0.354	**0.96**	0.215	0.96	0.37	0.96	**0.52**	0.96			
Cuvier's beaked whale	**0.567**	**0.23**	0.362	0.23	0.39	0.23	0.37	0.23	0.61	0.23	0.58
Pacific white-sided dolphin	**0.809**	1	0.519	1	0.4	**0.97**	0.45	0.97			
Dall's porpoise	**1.221**	**0.79**	0.855	0.79	0.74	0.822	0.91	0.822			
Survey region	US West Coast		US West Coast		US West Coast		US West Coast		Hawaii		Eastern Tropical Pacific
Number of observers	3		3		3		3		3		3
Speed of vessel (kts)	9-10		9-10		9-10		9-10		9-10		9-10
Height of flying bridge (m)	10.5		10.5		10.5 and 15.2		10.5 and 15.2		10.5		10.5
Big Eyes binoculars	two pair		two pair		two pair		two pair		two pair		two pair
Sea conditions	up to B05		up to B05		up to B05		up to B05		up to B05		up to B05

Conservative values for each species are bolded

Table E-3. Densities calculated from data presented in Waite (2003) using f(0) and g(0) values from Table 2.

Species	n = animal groups on effort[a]	s = mean group size[a]	L = transect length (km^2)[a]	f_0 = perpendicular sighting distance[b]	g_0 = probability of seeing group directly on trackline[b]	Density/km^2 = (n) (s) (f_0) / (2L) (g_0) [c]
Minke whale	3	1.3	2242	0.567	0.84	0.0006
Sperm whale	2	1.2	2242	0.462	0.87	0.0003
Baird's beaked whale	1	4	2242	0.52	0.96	0.0005
Cuvier's beaked whale	1	4	2242	0.567	0.23	0.0022
Pacific white-sided dolphin	2	56	2242	0.809	0.97	0.0208
Dall's porpoise	196	2.8	2242	1.221	0.79	0.1892

[a] from Waite (2003), [b] Values for f0 and g0 taken from Table 12, [c] Calculation taken from Barlow (2003).
There is no variance associated with these density calculations so there is no way to indicate the confidence in the value. Densities from sperm, Pacific white-sided, Baird's and Cuvier's beaked whales are quite weak as they are based on only 1-2 sightings.

E.1.2 Depth Distribution

There are limited depth distribution data for most marine mammals. This is especially true for cetaceans, as they must be tagged at-sea and by using a tag that either must be implanted in the skin/blubber in some manner or adhere to the skin. There is slightly more data for some pinnipeds, as they can be tagged while on shore during breeding or molting seasons and the tags can be glued to the pelage rather than implanted. There are a few different methodologies/ techniques that can be used to determine depth distribution percentages, but by far the most widely used technique currently is the time-depth recorder. These instruments are attached to the animal for a fairly short period of time (several hours to a few days) via a suction cup or glue, and then retrieved immediately after detachment or when the animal returns to the beach. Depth information can also be collected via satellite tags, sonic tags, digital tags, and, for sperm whales, via acoustic tracking of sounds produced by the animal itself.

There are somewhat suitable depth distribution data for a few marine mammal species. Sample sizes are usually extremely small, nearly always fewer than 10 animals total and often only one or two animals. Depth distribution information can also be interpreted from other dive and/or preferred prey characteristics, and from methods including behavioral observations, stomach content analysis and habitat preference analysis. Depth distributions for species for which no data are available were extrapolated from similar species.

Depth distribution information for marine mammal species with regular occurrence and for which densities are available is provided in Table 4. More detailed summary depth information for species in the GOA for which densities are available is included as Table 6.

E.1.3 DENSITY AND DEPTH DISTRIBUTION COMBINED

Density is nearly always reported for an area, e.g., animals/km^2. Analyses of survey results using Distance Sampling techniques include correction factors for animals at the surface but not seen as well as animals below the surface and not seen. Therefore, although the area (e.g., km^2) appears to represent only the surface of the water (two-dimensional), density actually implicitly includes animals anywhere within the water column under that surface area. Density assumes that animals are uniformly distributed within the prescribed area, even though this is likely rarely true. Marine mammals are usually clumped in areas of greater importance, for example, areas of high productivity, lower predation, safe calving, etc. Density can occasionally be calculated for smaller areas that are used regularly by marine mammals, but more often than not, there are insufficient data to calculate density for small areas. Therefore, assuming an even distribution within the prescribed area remains the norm.

The ever-expanding database of marine mammal behavioral and physiological parameters obtained through tagging and other technologies has demonstrated that marine mammals use the water column in various ways, with some species capable of regular deep dives (>800 m) and others regularly diving to <200 m, regardless of the bottom depth. Therefore, assuming that all species are evenly distributed within the water column does not accurately reflect behavior and can present a distorted view of marine mammal distribution in any region.

By combining marine mammal density with depth distribution information, a more accurate three-dimensional density estimate is possible. These 3-D estimates allow more accurate modeling of potential marine mammal exposures from specific noise sources.

This document is organized into taxonomic categories: Mysticetes, Odontocetes and the pseudo-taxonomic category Pinnipeds. Nomenclature was adopted from the Integrated Taxonomic Information System (www.itis.gov). Distribution and density summaries are followed by discussions of depth distribution for those species that have regular occurrence. Density and depth info are **bolded** in text.

Table E-4. Summary of marine mammal depth distributions for the TMAA

Common Name	Scientific Name	Depth Distribution	Reference
MYSTICETES - Baleen whales			
Fin whale	*B. physalus*	44% at <50m, 23% at 50-225m, 33% at >225m	Goldbogen et al. (2006)
Minke whale	*B. acutorostrata*	53% at <20m, 47% at 21-65m	Blix and Folkow (1995)
Humpback whale	*Megaptera novaeangliae*	37% at <4m, 25% at 4-20m, 7% at 21-35m,4% at 36-50m, 6% at 51-100m, 7% at 101-150m, 8% at 151-200m, 6% at 201-300m, <1% at >300m	Dietz et al. (2002)
Gray whale	*Eschrichtius robustus*	40% at <4 m, 38% at 4-30 m, 22% at >30 m	Malcolm et al. (1995/96); Malcolm and Duffus (2000)
ODONTOCETES - Toothed whales			
Sperm whale	*Physeter catodon*	31% at <10 m, 8% at 10-200 m, 9% at 201-400 m, 9% at 401-600 m, 9% at 601-800 m and 34% at >800 m	Amano and Yoshioka (2003)
Cuvier's beaked whale	*Ziphius cavirostris*	27% at <2 m, 29% at 2-220 m, 4% at 221-400 m, 4% at 401-600 m, 4% at 601-800 m, 5% at 801-1070 m and 27% at >1070 m	Tyack et al. (2006)
Baird's beaked whale	*Berardius bairdii*	34% at 0-40 m, 39% at 41-800 m, 27% at >800 m	extrapolated from northern bottlenose whale (Hooker and Baird, 1999)
Killer whale	*Orcinus orca*	96% at 0-30 m, 4% at >30 m	Baird et al. (2003)
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	Daytime: 100% at 0-65 m; Nighttime: 100% at 0-130 m	extrapolated from other *Lagenorhynchus* (Mate et al., 1994; Benoit-Bird et al., 2004)
Dall's porpoise	*Phocoenoides dalli*	39% at <1 m, 8% at 1-10 m, 45% at 11-40 m, and 8% at >40 m	Hanson and Baird (1998)
PINNIPEDS			
Northern fur seal	*Callorhinus ursinus*	Daytime: 74% at <2 m; 26% at 2-260 m; Nighttime: 74% at <2 m; 26% at 2-75 m	Ponganis et al. (1992); Kooyman and Goebel (1986); Sterling and Ream (2004); Gentry et al. (1986)
Steller sea lion	*Eumetopias jubatus*	60% at 0-10 m, 22% at 11-20 m, 12% at 21-50 m, 5% at 51-100 m and 1% at >100 m	Merrick and Loughlin (1997)
Northern elephant seal	*Mirounga angustirostris*	9% at <2 m, 11% at 2-100 m, 11% at 101-200 m, 11% at 201-300 m, 11% at 301-400 m, 11% at 401-500 m and 36% at >500 m	Asaga et al. (1994)

E.2 MYSTICETES

E.2.1 Blue whale, *Balaenoptera musculus*

Blue whales were previously sighted and caught throughout the GOA, but are rarely seen in the post-whaling era; two blue whales seen in 2004 during a NMFS humpback whale study and approximately 150 nm southeast of Prince William Sound are the first documented sightings of blue whales in several decades. There may be two to five stocks of blue whale in the north Pacific (Angliss and Allen, 2009).

The Eastern North Pacific population, which winters as far south as the eastern tropical Pacific, has been sighted off Oregon and Washington although sightings are rare and there is no abundance estimate (Angliss and Allen, 2009). Blue whale calls attributed to this stock as well as the Northwestern stock were recorded in the Gulf of Alaska (Stafford, 2003) via hydrophones located offshore of the TMAA. Both call types were recorded seasonally, with peak occurrence from August-November. Blue whales are likely present in low numbers in the GOA; **there is no density estimate available (Table 1)**.

E.2.2 Fin whale, *Balaenoptera physalus*

Fin whales were extensively hunted in coastal waters of Alaska as they congregated at feeding areas in the spring and summer (Mizroch et al., 2009). There has been little effort in the GOA since the cessation of whaling activities to assess abundance of large whale stocks. Fin whale calls have been recorded year-round in the GOA, but are most prevalent from August-February (Moore et al., 1998; 2006). Zerbini et al. (2006) sighted fin whales south of the Kenai Peninsula, and calculated a density of 0.008/km^2 (see Table 4, Block 1 in Zerbini et al., 2006). Waite (2003) recorded 55 fin whale sightings on effort, with several occurring within the TMAA (see Figure 2 in Waite, 2003). Rone et al. (2009) recorded 24 sightings of 64 fin whales during a 10-day cruise in the TMAA in April 2009. Density for the inshore stratum was estimated as 0.012/km^2, while density in the offshore stratum was estimated as 0.009/km^2 (Table 9, Rone et al., 2009). **Combined density for the TMAA was 0.010/km^2, which is applicable to the entire region year round (Table 1).**

Fin whales feed on planktonic crustaceans, including *Thysanoessa* sp and *Calanus* sp, as well as schooling fish including herring, capelin and mackerel (Aguilar, 2002). Depth distribution data from the Ligurian Sea in the Mediterranean are the most complete (Panigada et al., 2003; Panigada et al., 2006), and showed differences between day and night diving; daytime dives were shallower (<100m) and night dives were deeper (>400m), likely taking advantage of nocturnal prey migrations into shallower depths; this data may be atypical of fin whales elsewhere in areas where they do not feed on vertically-migrating prey. Traveling dives in the Ligurian Sea were generally shorter and shallower (mean = 9.8 m, maximum = 20 m) than feeding dives (mean = 181m, maximum = 474 m) (Jahoda et al., 1999). Goldbogen et al. (2006) studied fin whales in southern California and found that ~56% of total time was spent diving, with the other 44% near surface (<50m); dives were to >225 m and were characterized by rapid gliding ascent, foraging lunges near the bottom of dive, and rapid ascent with flukes. Dives are somewhat V-shaped although the bottom of the V is wide. **Therefore, % of time at depth levels is estimated as 44% at <50m, 23% at 50-225 m (covering the ascent and descent times) and 33% at >225 m.**

E.2.3 Sei whale, *Balaenoptera borealis*

Sei whales occur in all oceans from subtropical to sub-arctic waters, and can be found on the shelf as well as in oceanic waters (Reeves et al., 2002). They are known to occur in the GOA and as far north as the Bering Sea in the north Pacific. However, their distribution is poorly understood. The only stock estimate for U.S. waters is for the eastern north Pacific stock offshore California, Oregon and Washington (Carretta et al., 2009); abundance in Alaskan waters is unknown and they were not been sighted during recent surveys (Waite, 2003; Rone et al., 2009). Sei whales are likely present in low numbers in the GOA; **there is no density estimate available (Table 1)**.

E.2.4 Minke whale, *Balaenoptera acutorostrata*

Minke whales are the smallest of all mysticete whales. They are widely distributed in the north Atlantic and Pacific, and appear to undergo migration between warmer waters in winter and colder waters in summer. Minke whales can be found in near shore shallow waters and have been detected acoustically in offshore deep waters. There is no current abundance estimate for the Alaska stock of minke whales (Angliss and Allen, 2009). Zerbini et al. (2006) sighted minke whales near Kodiak Island (and a single sighting nearshore off the Kenai Peninsula), and calculated a density of 0.006/km^2 (see Table 4, Block 3 in Zerbini et al., 2006). Waite (2003) recorded three minke sightings on effort, all southeast of the Kenai

Peninsula (see Figure 2 in Waite, 2003). Rone et al. (2009) sighted three minke whales in April 2009, all of which were in the Nearshore stratum, but no density was calculated. **Density calculated from Waite (2003) data yielded a density of 0.0006/km^2 (Table 1), which is applicable to the entire region year round.** Although this is lower than density calculated by Zerbini et al. (2006), it is likely more representative of minke whale abundance in the region as the Waite (2003) surveys were farther offshore.

Minke whales feed on small schooling fish and krill, and are the smallest of all balaenopterid species which may affect their ability to dive. Hoelzel et al. (1989) observed minke whales feeding off the San Juan Islands of Puget Sound, Washington, where 80% of the feeding occurred over depths of 20-100m and two types of feeding were observed near surface, lunge feeding and bird association. The only depth distribution data for this species were reported from a study on daily energy expenditure conducted off northern Norway and Svalbard (Blix and Folkow, 1995). The limited depth information available (from Figure 2 in Blix and Folkow, 1995) was representative of a 75-min diving sequence where the whale was apparently searching for capelin, then foraging, then searching for another school of capelin. Search dives were mostly to ~20 m, while foraging dives were to 65 m. **Based on this very limited depth information, rough estimates for % of time at depth are as follows: 53% at <20 m and 47% at 21-65 m.**

E.2.5 Humpback whale, *Megaptera novaeangliae*

Humpback whales are found in all oceans, in both coastal and continental waters as well as near seamounts and in deep water during migration (Reeves et al., 2002). Some populations have been extensively studied (e.g., Hawaii, Alaska, Caribbean), and details about migratory timing, feeding and breeding areas are fairly well known (e.g., Calambokidis et al., 2008). Humpbacks are highly migratory, feeding in summer at mid and high latitudes and calving and breeding in winter in tropical or subtropical waters. Humpbacks feeding in the TMAA in summer appear to winter in Hawaiian and Mexican waters (Calambokidis et al., 2008). Humpbacks are present in Alaskan waters during summer and fall, although there may be a few stragglers that remain year round. Waite (2003) recorded 41 humpback whale sightings on effort, with several occurring near shore around the Kenai Peninsula (see Figure 2 in Waite, 2003). Rone et al. (2009) recorded 11 sightings of 20 individuals during a 10-day cruise in the TMAA in April 2009. Density for the inshore stratum was estimated as 0.004/km^2, while density in the offshore stratum was estimated as 0.0005/km^2 (Table 9, Rone et al., 2009). **Combined density for the TMAA was 0.0019/km^2, which is applicable to the entire region year round (Table 1).** Calambokidis et al. (2008) estimated 3,000-5,000 humpbacks in the entire GOA, an area much larger than the TMAA.

Humpback whales feed on pelagic schooling euphausiids and small fish including capelin, herring and mackerel (Clapham, 2002). Like other large mysticetes, they are a "lunge feeder" taking advantage of dense prey patches and engulfing as much food as possible in a single gulp. They also blow nets, or curtains, of bubbles around or below prey patches to concentrate the prey in one area, then lunge with open mouths through the middle. Dives appear to be closely correlated with the depths of prey patches, which vary from location to location. In the north Pacific, most dives were of fairly short duration (<4 min) with the deepest dive to 148 m (southeast Alaska; Dolphin, 1987), while whales observed feeding on Stellwagen Bank in the North Atlantic dove to <40 m (Hain et al., 1995). Hamilton et al. (1997) tracked one possibly feeding whale near Bermuda to 240 m depth. Depth distribution data collected at a feeding area in Greenland resulted in the following estimation of depth distribution: **37% of time at <4 m, 25% of time at 4-20 m, 7% of time at 21-35m, 4% of time at 36-50 m, 6% of time at 51-100 m, 7% of time at 101-150 m, 8% of time at 151-200 m, 6% of time at 201-300 m, and <1% at >300 m** (Dietz et al., 2002).

E.2.6 North Pacific right whale, *Eubalaena japonica*

North Pacific right whales were heavily hunted near Kodiak Island from the mid-1800s through the early 1900s. Despite international protection, the species has not recovered and remains one of the rarest of all

cetaceans. There have been only two verified sightings of right whales in the GOA since the 1970s, with one occurring very near Kodiak Island (Shelden et al., 2005). Regular sightings of right whales do occur in the southeastern Bering Sea in summer, where up to 13 individual whales have been identified based on photos and biopsy dart data, but their winter habitat remains unknown. Acoustic monitoring for right whales was carried out via autonomous hydrophones in 2000-2001 near Kodiak Island, and right whale calls were recorded in August and early September (Moore et al., 2006; Mellinger et al., 2004b). Right whales are likely present in extremely low numbers in the GOA; **there is no density estimate available (Table 1).**

E.2.7 Gray whale, *Eschrichtius robustus*

The current stock estimate for the eastern north Pacific stock of gray whales is 18,813 (Angliss and Allen, 2009). Gray whales undertake a well-documented migration from winter calving lagoons in Baja California to summer feeding areas in the Bering and Chukchi seas (Swartz et al., 2006). Their migration route is primarily near shore in shallow water, although gray whales have been documented swimming offshore near the Channel Islands in the Southern California Bight. In addition to the Bering and Chukchi sea feeding areas, gray whales are known to feed opportunistically at several locations along the migratory route. Two such areas are near Ugak Bay, Kodiak Island, and along the outer coast of southeast Alaska where 30-50 gray whales have been sighted feeding year round (Moore et al., 2007). Gray whales would not be found in most of the TMAA but likely do cross the northernmost section (estimated at 2,400 km^2 via ArcMap and representing 2.75% of the total TMAA; 2,400 km^2/87,250 km^2 as measured in ArcMap) migrating to and from both local and distant feeding grounds. Rone et al. (2009) recorded three sightings of eight gray whales (see Figure 3 in Rone), which were located nearshore at Kodiak Island to the west of the TMAA and in the westernmost section of the TMAA on the continental shelf. The number of gray whales within the TMAA at any given time is likely quite small as it is probably at the deeper limit of their occurrence. Therefore, the lower estimate of Kodiak Island feeding gray whales from Moore et al. (2007) was used to estimate density. **Density was estimated at 0.0125/km^2 (30 gray whales/2,400 km^2) year round, and is applicable only for the farthest north area of the TMAA (2.75 % of area, see Figure 1) for an overall density for the TMAA of 0.0003/km^2 (Table 1).**

Gray whales migrate from breeding and calving grounds in Baja California to primary feeding grounds in the Bering and Chukchi Seas between Alaska and Russia. Behavior, including diving depth and frequency, can vary greatly between geographic regions. Gray whales feed on the bottom, mainly on benthic amphipods that are filtered from the sediment (Reeves et al., 2002), so dive depth is dependent on depth at location for foraging whales. There have been several studies of gray whale movement within the Baja lagoons (Harvey and Mate, 1984; Mate and Harvey, 1984), but these are likely not applicable to gray whales elsewhere. Mate and Urban Ramirez (2003) noted that 30 of 36 locations for a migratory gray whale with a satellite tag were in water <100m deep, with the deeper water locations all in the southern California Bight within the Channel Islands. There has been only one study of a gray whale dive profile, and all information was collected from a single animal that was foraging off the west coast of Vancouver Island (Malcolm and Duffus, 2000; Malcolm et al.,1995/96). They noted that the majority of time was spent near the surface on interventilation dives (<3 m depth) and near the bottom (extremely nearshore in a protected bay with mean dive depth of 18 m, range 14-22 m depth). There was very little time spent in the water column between surface and bottom. Foraging depth on summer feeding grounds is generally between 50-60 m (Jones and Swartz, 2002). Based on this very limited information, **the following is a rough estimate of depth distribution for gray whales: 40% of time at <4 m (surface and interventilation dives), 38% of time at 3-30 m (active migration), 22% of time at >30 m (foraging).**

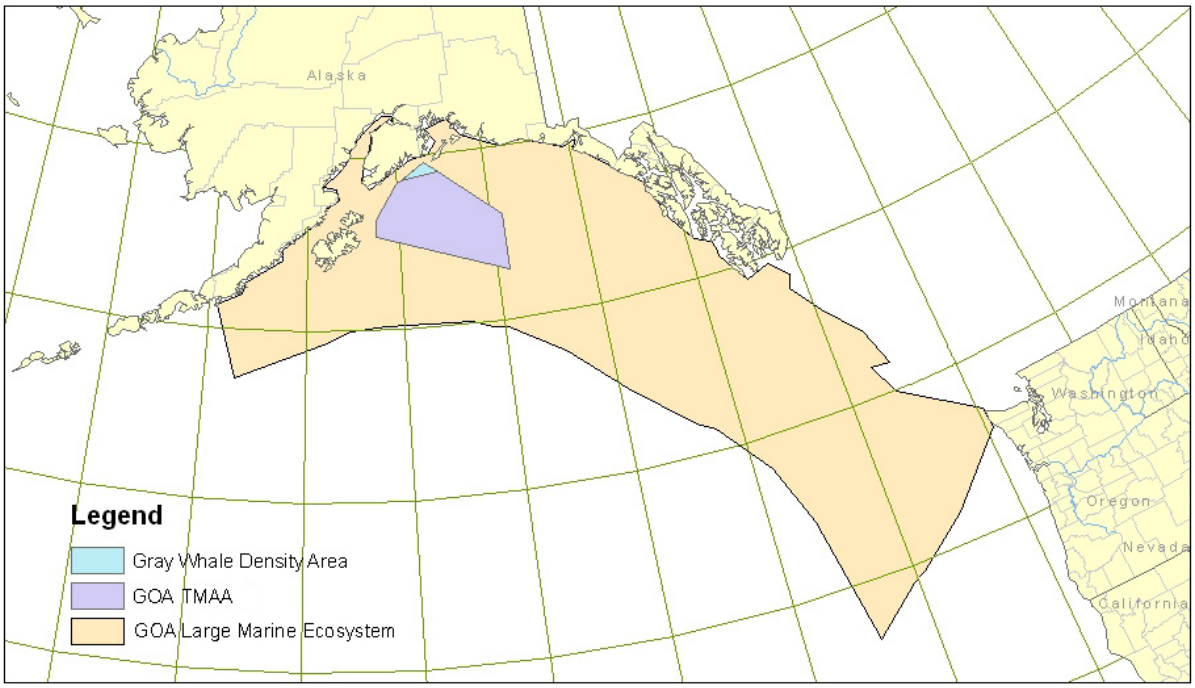


Figure E-1. TMAA, GOA Large Marine Ecosystem and Gray Whale Density Area.

E.3 ODONTOCETES

E.3.1 Sperm whale, *Physeter catodon*

Sperm whales are well known from the GOA region. Sperm whales are most often found in deep water, near submarine canyons, and along the edges of banks and over continental slopes (Reeves et al., 2002). Acoustic evidence collected via autonomous recorders suggests that sperm whales are present in the offshore regions of the GOA year round (see Figure 2 in Mellinger et al., 2004a). Rone et al. (2009; Figure 8) recorded sperm whales acoustically in both the inshore and offshore strata of the TMAA in April 2009; no sperm whales were detected visually. Waite (2003) recorded two on-effort sightings of sperm whales; both within the TMAA (see Figure 2 in Waite, 2003). **Data from vessel surveys conducted by Waite (2003) yielded a density of 0.0003/km^2 (Table 1), which is applicable to the entire region year round.** Density was based on only two sightings, so confidence in the value is low, but it is the only density that exists at this time for the region.

Unlike other cetaceans, there is a preponderance of dive information for this species, most likely because it is the deepest diver of all cetacean species so generates a lot of interest. Sperm whales feed on large and medium-sized squid, octopus, rays and sharks, on or near the ocean floor (Whitehead, 2002; Clarke, 1986). Some evidence suggests that they do not always dive to the bottom of the sea floor (likely if food is elsewhere in the water column), but that they do generally feed at the bottom of the dive. Davis et al. (2007) report that dive-depths (100-500 m) of sperm whales in the Gulf of California overlapped with depth distributions (200-400 m) of jumbo squid, based on data from satellite-linked dive recorders placed on both species, particularly during daytime hours. Their research also showed that sperm whales foraged throughout a 24-hour period, and that they rarely dove to the sea floor bottom (>1000 m). The most consistent sperm whale dive type is U-shaped, during which the whale makes a rapid descent to the bottom of the dive, forages at various velocities while at depth (likely while chasing prey) and then ascends rapidly to the surface. There is some evidence that male sperm whales, feeding at higher latitudes

during summer months, may forage at several depths including <200 m, and utilize different strategies depending on position in the water column (Teloni et al., 2007). Perhaps the best source for depth distribution data comes from Amano and Yoshioka (2003), who attached a tag to a female sperm whale near Japan in an area where water depth was 1000-1500m. Based on values in Table 1 (in Amano and Yoskioka, 2003) for dives with active bottom periods, the total dive sequence was 45.9 min (mean surface time plus dive duration). Mean post-dive surface time divided by total time (8.5/45.9) plus time at surface between deep dive sequences yields a percentage of time at the surface (<10 m) of 31%. Mean bottom time divided by total time (17.5/45.9) and adjusted to include the percentage of time at the surface between dives, yields a percentage of time at the bottom of the dive (in this case >800 m as the mean maximum depth was 840 m) of 34%. Total time in the water column descending or ascending results from the duration of dive minus bottom time (37.4-17.5) or ~20 minutes. Assuming a fairly equal descent and ascent rate (as shown in Table 1 in Amano and Yoshioka) and a fairly consistent descent/ascent rate over depth, we assume 10 minutes each for descent and ascent and equal amounts of time in each depth gradient in either direction. Therefore, 0-200 m = 2.5 minutes one direction (which correlates well with the descent/ascent rates provided) and therefore 5 minutes for both directions. The same is applied to 201-400 m, 401-600 m and 601-800 m. **Therefore, the depth distribution for sperm whales based on information in the Amano paper is: 31% in <10 m, 8% in 10-200 m, 9% in 201-400 m, 9% in 401-600 m, 9% in 601-800 m and 34% in >800 m.** The percentages derived above from data in Amano and Yoshioka (2003) are in fairly close agreement with those derived from Table 1 in Watwood et al. (2006) for sperm whales in the Ligurian Sea, Atlantic Ocean and Gulf of Mexico.

E.3.2 Cuvier's beaked whale, *Ziphius cavirostris*

Cuvier's beaked whale has the widest distribution of all beaked whales, and occurs in all oceans. It is most often found in deep offshore waters, and appear to prefer slope waters with steep depth gradients. There are no reliable population estimates for this species in Alaskan waters (Angliss and Allen, 2009). **Data from vessel surveys conducted by Waite (2003) yielded a density of 0.0022/km^2 (Table 1), which is applicable to the entire region year round.** Density was based on a single sighting, so confidence in the value is low, but it is the only density available for this region.

Cuvier's feed on mesopelagic or deep water benthic organisms, particularly squid (Heyning, 2002). Stomach content analyses indicate that they take advantage of a larger range of prey species than do other deep divers (e.g., Santos et al., 2001; Blanco and Raga, 2000). Cuvier's, like other beaked whales, are likely suction feeders based on the relative lack of teeth and enlarged hyoid bone and tongue muscles. Foraging dive patterns appear to be U-shaped, although inter-ventilation dives are shallower and have a parabolic shape (Baird et al., 2006a). Depth distribution studies in Hawaii (Baird et al., 2005a; Baird et al., 2006a) found that Cuvier's undertook three or four different types of dives, including intermediate (to depths of 292-568 m), deep (>1000 m) and short-inter-ventilation (within 2-3 m of surface); this study was of a single animal. Studies in the Ligurian Sea indicated that Cuvier's beaked whales dived to >1000 m and usually started "clicking" (actively searching for prey) around 475 m (Johnson et al., 2004; Soto et al., 2006). Clicking continued at depths and ceased once ascent to the surface began, indicating active foraging at depth. In both locations, Cuvier's spent more time in deeper water than did Blainville's beaked whale, although maximum dive depths were similar. There was no significant difference between day and night diving indicating that preferred prey likely does not undergo vertical migrations.

Dive information for Cuvier's was collected in the Ligurian Sea (Mediterranean) via DTAGs on a total of seven animals (Tyack et al., 2006) and, despite the geographic difference and the author's cautions about the limits of the data set, the Ligurian Sea dataset represents a more complete snapshot than that from Hawaii (Baird et al., 2006a). Cuvier's conducted two types of dives – U-shaped deep foraging dives (DFD) and shallow duration dives. Dive cycle commenced at the start of a DFD and ended at the start of the next DFD, and included shallow duration dives made in between DFD.

Mean length of dive cycle = 121.4 min (mean DFD plus mean Inter-deep dive interval)

Number of DFD recorded = 28

Mean DFD depth = 1070 m (range 689-1888 m)

Mean length DFD = 58.0 min

Mean Vocal phase duration = 32.8 min

Mean inter-deep dive interval = 63.4 min

Mean shallow duration dive = 221 m (range 22-425 m)

Mean # shallow duration dives per cycle = 2 (range 0-7)

Mean length of shallow duration dives = 15.2 min

Total time at surface (0-2 m) was calculated by subtracting the mean length of DFD and two shallow duration dives from the total dive cycle (121.4 - 58.0 – 30.4 = 33 min). Total time at deepest depth was taken from the Vocal phase duration time, as echolocation clicks generally commenced when animals were deepest, and was 32.8 min. The amount of time spent descending and ascending on DFDs was calculated by subtracting the mean Vocal phase duration time from the mean total DFD (58.0 - 32.8 = 25.2 min) and then dividing by five (# of 200 m depth categories between surface and 1070 m) which equals ~five min per 200 m. The five-minute value was applied to each 200 m depth category from 400-1070 m; for the 2-220 m category, the mean length of shallow duration dives was added to the time for descent/ascent (30.4 + 5 = 35.4 min). **Therefore, the depth distribution for Cuvier's beaked whales based on best available information from Tyack et al. (2006) is: 27% at <2 m, 29% at 2-220 m, 4% at 221-400 m, 4% at 401-600 m, 4% at 601-800 m, 5% at 801-1070 m and 27% in >1070 m.**

E.3.3 Baird's beaked whale, *Berardius bairdii*

Baird's beaked whales, like most beaked whales, are a deep water species that inhabits the north Pacific. They generally occur close to shore only in areas with a narrow continental shelf. There is no reliable population estimate for this species in Alaskan waters (Angliss and Allen, 2009). **Data from vessel surveys conducted by Waite (2003) yielded a density of 0.0005/km^2 (Table 1), which is applicable to the entire region year round.** Density was based on a single sighting, so confidence in the value is low, but it is the only density available for this region.

There are no depth distribution data for this species. Studies conducted on the diet of Baird's from stomach content analysis reveal some insight into feeding patterns. Samples collected off the Pacific coast of Honshu, Japan, revealed a preference primarily for benthopelagic fish (87%) and cephalopods (13%), while samples collected in the southern Sea of Okhotsk were primarily cephalopods (Walker et al., 2002). Other stomach samples collected from same geographic regions indicated demersal fish were the most commonly identified prey, and that Baird's were feeding at the bottommost depths of at least 1000 m (Ohizumi et al., 2003). The overall dive behavior of this beaked whale is not known (e.g., shape of dive, interventilation dives, etc). In lieu of other information, the depth distribution for northern bottlenose whales, *Hyperoodon ampullatus,* will be extrapolated to Baird's. There has been one study on northern bottlenose whales, which provides some guidance as to depth distribution (Hooker and Baird, 1999). Most (62-70%, average = 66%) of the time was spent diving (deeper than 40 m), and most dives were somewhat V-shaped. Both shallow dives (<400 m) and deep dives (>800 m) were recorded, and whales spent 24-30% (therefore, average of 27%) of dives at 85% maximum depth indicating they feed near the bottom. Using these data points, we **estimate 34% of time at 0-40 m, 39% at 41-800 m, 27% at >800 m for *H. ampullatus* and extrapolate this to *B. berardius*.**

E.3.4 Stejneger's beaked whale, *Mesoplodon stejnegeri*

Stejneger's beaked whale is known from the north Pacific only, ranging in subarctic and cool temperate waters. It is likely the only mesoplodont whale to be found in the GOA, as other *Mesoplodon* species do not range that far north. There is no abundance estimate for this species, as it is rarely seen at-sea and is most often recorded via stranding events (Angliss and Allen, 2009). Stejneger's beaked whales are likely present in low numbers in the GOA; **there is no density estimate available (Table 1)**.

E.3.5 Killer whale, *Orcinus orca*

There are two stocks of killer whales in the north Pacific whose ranges overlap in the GOA, but who differ in feeding preferences, acoustics and genetics. The Alaska Resident stock feeds primarily on fish, ranges from southeast Alaska to the Aleutian Islands and Bering Sea, and has a minimum population estimate of 1,123 based on photo ID (Angliss and Allen, 2009). The Gulf of Alaska, Aleutian Islands and Bering Sea Transient stock feeds primarily on other marine mammals and ranges farther offshore in the GOA than the resident stock, as well as to the Aleutian Islands and Bering Sea. The minimum estimate based on photo ID for that population is 314. Vessel surveys for killer whales were conducted in July and August from 2001-2003 near Steller sea lion haulouts from the Kenai Peninsula to Amchitka Pass in the Aleutian Islands (Zerbini et al., 2007). The surveys did not venture far from shore but do provide density estimates for transient and resident stocks. **Survey blocks closest to the TMAA (blocks 2-5) had an average density of 0.010/km^2 resident killer whales (IGS density which the authors indicate is more appropriate for resident killer whales), which is applicable to the entire region year round (Table 3).** Killer whales were seen and heard during a vessel cruise in the TMAA in April 2009 (Rone et al., 2009; Figures 4 and 8), but density was not calculated.

Diving studies on killer whales have been undertaken mainly on "resident" (fish-eating) killer whales in the Puget Sound and may not be applicable across all populations of killer whales. Diving is usually related to foraging, and mammal-eating killer whales may display different dive patterns. Killer whales in one study (Baird et al., 2005b) dove as deep as 264 m, and males dove more frequently and more often to depths >100 m than females, with fewer deep dives at night. Using best available data from Baird et al. (2003), it would appear that **killer whales spend ~4% of time at depths >30 m and 96% of time at depths <30 m**. Dives to deeper depths were often characterized by velocity bursts which may be associated with foraging or social activities.

E.3.6 Beluga, *Delphinapterus leucas*

A genetically and geographically discrete population of belugas exists in Cook Inlet. Scattered sightings of belugas in the northern GOA have been recorded since the mid-1970s, and these animals may be part of the Cook Inlet stock (Laidre et al., 2000) or may be part of a group of belugas that appear to be resident to Yakutat Bay (O'Corry-Crowe et al., 2006). An in-depth review of 13 dedicated cetacean surveys in the GOA found that all northern GOA sightings were coastal and none were reported in offshore areas. **No density is available (Table 1).**

E.3.7 Pacific white-sided dolphin, *Lagenorhychus obliquidens*

Pacific white-sided dolphins range throughout the north Pacific in cold temperate waters. Movements between inshore/offshore and north/south are not well understood. The north Pacific stock of this species, which ranges from British Columbia across the north Pacific and including the GOA, is currently estimated to have a minimum abundance of 26,880 based on data collected from 1987-90 (Angliss and Allen, 2009). **Data from vessel surveys conducted by Waite (2003) yielded a density of 0.0208/km^2 (Table 1), which is applicable to the entire region year round.** This density was based on just two sightings so confidence in this value is low, but it is the only density available for this region. Rone et al. (2009) collected one sighting of 60 Pacific white-sided dolphins during the April 2009 cruise; the sighting was outside of the TMAA, south of Kodiak Island (See Figure 4 in Rone).

Pacific white-sided dolphins are generalist feeders (von Waerebeek and Wursig, 2002). Studies on diving by this species have not been undertaken. Satellite tag studies of a rehabilitated related species (*Lagenorhynchus acutus*) in the Gulf of Maine indicated that nearly all time was spent in waters <100 m total depth with largely directed movement (Mate et al., 1994). Another related species, *Lagenorhynchus obscurus*, was observed feeding in two circumstances; at night to 130 m depth to take advantage of the deep scattering layer closer to the surface and during the day in shallower depths (<65 m) where they fed on schooling fish (Benoit-Bird et al., 2004). **In lieu of the lack of other data available for this Pacific lags, the following are very rough estimates of time at depth: daytime - 100% at 0-65 M; night time – 100% at 0-130 m.**

E.3.8 Northern right whale dolphin, *Lissodelphis borealis*

The northern right whale dolphin occurs in a band across the north Pacific, generally between 34° and 47°N (Reeves et al., 2002). They are primarily an open ocean species, and rarely come near shore. Their presence in the GOA is unknown but, based on the lack of sightings of this gregarious species, is likely rare; **there is no density for this species (Table 1)**.

E.3.9 Risso's dolphin, *Grampus griseus*

This species is known from tropical and warm temperate oceans, primarily in waters with surface temperatures between 50 and 82°F (Reeves et al., 2002). Their presence in the GOA is likely extremely rare and extralimital; **there is no density for this species (Table 1).**

E.3.10 False killer whale, *Pseudorca crassidens*

False killer whales are found from tropical to warm temperate waters, with well known populations near Japan and in the eastern tropical Pacific. They were not seen along the Pacific US coast during surveys conducted from 1986-2001 (Ferguson and Barlow, 2003; Barlow, 2003) nor in 2005 (Forney, 2007), although they have occasionally been sighted as far north as British Columbia (Reeves et al., 2002). Their presence in the GOA is likely extremely rare and extralimital; **there is no density for this species (Table 1).**

E.3.11 Short-finned pilot whale, *Globicephala macrorhynchus*

This species is known from tropical and warm temperate waters and, in the northeast Pacific, its distribution likely extends as far north as Vancouver Island (Reeves et al., 2002). Pilot whales were not seen during vessel surveys conducted offshore Washington and Oregon in 1996 or 2001 (Barlow, 2003) and there was only one sighting during surveys conducted in 2005 (Forney, 2007). Their presence in the GOA is likely extremely rare and extralimital; **there is no density for this species (Table 1).**

E.3.12 Dall's porpoise, *Phocoenoides dalli*

Dall's porpoises are endemic to the north Pacific, ranging north of ~32° into the Bering Sea. It is generally found in deep, cool waters but is also common in coastal areas. The Alaska stock is currently estimated at 83,400 animals (Angliss and Allen, 2009). Waite (2003) sighted Dall's porpoise frequently throughout their study area, including several sightings south of the Kenai Peninsula and therefore within the TMAA. **Data from vessel surveys conducted by Waite (2003) yielded a density of 0.1892/km^2 (Table 1), which is applicable to the entire region year round.** Rone et al. (2009; Figure 4) recorded 10 sightings of 59 Dall's porpoise in both the inshore and offshore strata, but density was not calculated.

Dall's porpoise feed on a wide variety of schooling fish, including herring and anchovies, mesopelagic fish including deep-sea smelts, and squids (a, 2002). One study of this species includes dive information for a single animal (Hanson and Baird, 1998). The authors concluded that the animal responded to the TDR tag for the initial eight minutes it was in place. Therefore, using data only from dives 7-17 (after the abnormally deep high velocity dive) in Table 2 of Hanson and Baird (1998), total time of the sequence

was 26.5 min (from start of dive 7 to end of dive 17). Total time at the surface was 10.27 min (time between dives minus the dive durations). Dives within 10 m totaled 2.11 min, dives to >60 m totaled 0.4 min, and dives with bottom time between 41 and 60 m totaled 1.83 min. The remaining time can be assumed to be spent diving between 11 and 40 m. **Based on this information, the depth distribution can be estimated as 39% at <1 m, 8% at 1-10 m, 45% at 11-40 m, and 8% at >40 m.**

E.3.13 Harbor porpoise, *Phocoena phocoena*

Harbor porpoise are found in coastal regions of northern temperate and subarctic waters (Reeves et al., 2002). To determine abundance of harbor porpoises in southern Alaska, Dahlheim et al. (2000) conducted aerial surveys from 1991-1993 only within 30 km of shore, based on data from Dohl et al. (1983) that indicated that harbor porpoise off California were almost exclusively within 0.25 nm of shore. Sightings around Kodiak Island were clustered in near shore bays on the north side of the island, with only two sightings up to 30 km offshore (see Figures 2 and 4 in Dahlheim et al., 2000). Harbor porpoise are generally not found in water deeper than 100 m, and decline linearly as depth increases (Carretta et al., 2001; Barlow, 1988; Angliss and Allen, 2009). A survey conducted in the GOA in June 2003 yielded a single sighting of two individuals (Waite, 2003). The vessel survey conducted in April 2009 yielded 30 sightings of 89 harbor porpoise, most of which were outside of the TMAA (Rone et al., 2009; Figure 4). The coastal distribution and limitation to shallower depths make it likely that harbor porpoises would not be within the TMAA; **there is no density for this species (Table 1)**.

E.4 PINNIPEDS

E.4.1 Steller's sea lion, *Eumetopias jubatus*

The range of the Steller's sea lion (SSL) crosses the north Pacific from Japan to northern California. This species does not undergo extensive migrations but will disperse widely during the non-breeding season. There are two US stocks, which are delineated based on location of rookeries. The Western US stock, listed as Endangered, encompasses SSL using rookeries west of 144°W, and the Eastern US stock, listed as Threatened, include SSL whose rookeries are east of 144°W. SSL from both stocks likely use the TMAA. Most SSL remain fairly close to rookeries and haulouts throughout the year, with adult females with pups averaging 17 km trip length in summer and 130 km trip length in winter; however foraging trips extended to >500 km offshore (Loughlin, 2002; Merrick and Loughlin, 1997) which encompasses the entire TMAA. Foraging trips are interspersed with time spent at haulouts throughout the year, and different age and sex classes molt at different times from late summer through early winter. Consequently, at any particular time during the year, at least some portion of the population will be at-sea. Call et al. (2007) found that the duration of at-sea and on-shore cycles of juvenile SSL differed between regions. In the Aleutian Islands and GOA, juvenile SSL departed at dusk and returned to haul out just prior to sunrise, while juvenile SSL in southeast Alaska departed throughout the day. Time of day departures and length of time at-sea are likely related to foraging opportunities and the distance/depth required for juveniles to travel finding food.

Pinniped at-sea density is not generally calculated because they are counted much more easily while on shore. Therefore, to determine densities of SSL in the TMAA, two sets of parameters need to be identified – the specific area and the number of animals. The area of the TMAA (measured in ArcMap) is ~87,250 km^2 (Figure 1). This represents 6.25% of the entire GOA Large Marine Ecosystem (LME) as defined by NOAA (www.lme.noaa.gov), and measured via ArcMap (~1,396,800 km^2, not including inland passages). The GOA LME extends from the Alaska Peninsula in the west to the British Columbia-Washington border in the east. To determine the number of SSL in the GOA LME, the most recent counts of adult, juvenile and pup SSL at rookeries in the GOA (pups = 4,518, non-pups = 13,892; data from 2004-2005), southeast Alaska (n=20,793, data from 2005) and British Columbia (n=15,402, data from 2002) were combined for a total of 54,605 SSL (Angliss and Allen, 2009). These are considered minimum counts, as they were not corrected for animals not counted because they were at sea. Bonnell and Bowlby (1992) estimated that 25% of the SSL sea lion population was feeding at sea at any given time. Therefore, 13,651

SSL (54,605 * 0.25) would be expected feeding at-sea in the GOA LME. To estimate the number within the TMAA, the number of SSL in the entire GOA (13,651) was multiplied by the percent area of the TMAA compared to the GOA LME (0.0625) for a total of 853 SSL. **Density was then calculated as 853 SSL/87,250 km^2, or 0.0098/km^2, which is applicable to the entire region year round (Table 1).**

Acoustic modeling was calculated for two seasons, warm (June-October) and cold (November-May) water. Pinniped densities were therefore averaged to these two seasons by summing monthly densities and dividing by the number of months in each season (Table 5). For Steller sea lions the warm and cold water densities are the same, as densities are expected to remain consistent throughout the year.

Steller sea lions feed on fishes and invertebrates, including walleye pollock, Pacific cod, mackerel, octopus, squid and herring (Loughlin, 2002). Ongoing studies of SSL diving behavior have been conducted by NMFS in Alaska and Washington as part of an overall effort to determine why sea lion populations have been steadily declining (Merrick and Loughlin, 1997; Loughlin et al., 2003). Tagging studies often focus on different age classes (weanling, young of year, adult female). Steller sea lion prey changes depending on the season, with some prey moving farther offshore in winter, which affects maximum depth. Females dived the longest and deepest, with young of the year and weanlings having lesser values for both categories (Call et al., 2007; Loughlin et al., 2003). Adult males generally disperse farthest (commonly 120 km but as far as 500 km) from haulouts (Raum-Suryan et al., 2004). Loughlin et al. (2003) recorded maximum dive depth of 328 m, although most dives were shallower. Some SSL appear to take advantage of vertically migrating prey, leaving haulouts at dusk and returning at dawn (Call et al., 2007) but other SSL appear to feed throughout daylight hours as well. Because all age classes may be in the water at any given time, the depth distribution was estimated from the proportion of dives per depth range for all age classes (Merrick and Loughlin, 1997; Figures 4 and 2, respectively). **Based on this information, the depth distribution can be roughly estimated at 60% at 0-10 m, 22% at 11-20 m, 12% at 21-50 m, 5% at 51-100 m and 1% at >100 m.**

Table E-5. Averaging of Stellers sea lion, Northern fur seal, and Northern elephant seal densities to fit warm (June-October) and cold (November-May) water seasons.

Species	*Stellers sea lion*	*Northern fur seal*	*Northern elephant seal*
Month	***Density***		
June	0.0098	0.1059	0.0000
July	0.0098	0.0000	0.0000
August	0.0098	0.0000	0.0000
September	0.0098	0.0072	0.0055
October	0.0098	0.4768	0.0055
Average Warm Season	**0.0098**	**0.1180**	**0.0022**
November	0.0098	0.4768	0.0055
December	0.0098	0.4768	0.0000
January	0.0098	0.0072	0.0000
February	0.0098	0.0072	0.0000
March	0.0098	0.0072	0.0055
April	0.0098	0.0072	0.0055
May	0.0098	0.1059	0.0000
Average Cold Season	**0.0098**	**0.1555**	**0.0024**

E.4.2 Northern fur seal, *Callorhinus ursinus*

The northern fur seal is endemic to the north Pacific. Breeding sites are located in the Pribilof Islands (up to 70% of the world population) and Bogoslof Island in the Bering Sea, Kuril and Commander Islands in the northwest Pacific, and San Miguel Island in the southern California Bight. Abundance of the Eastern Pacific Stock has been decreasing at the Pribilof Islands since the 1940s although increasing on Bogoslof Island. The stock is currently estimated to number 665,550 (Angliss and Allen, 2009). The San Miguel Island Stock is much smaller, estimated at 9,424 (Carretta et al., 2009); this stock is believed to remain predominantly offshore California year round.

Males are present in the rookeries from around mid-May until August; females are present in the rookeries from mid-June to late-October. Nearly all fur seals from the Pribilof Island rookeries are foraging at sea from fall through late spring. Females and young males migrate through the Gulf of Alaska and feed primarily off the coasts of British Columbia, Washington, Oregon and California before migrating north to the rookeries (Ream et al., 2005). Immature males and females may remain in southern foraging areas year round until they are old enough to mate (National Marine Fisheries Service, 2006). Adult males migrate only as far as the Gulf of Alaska or to the west off the Kuril Islands. Therefore, adult males (September-April), adult females (October-December; May-June) and all non-adult fur seals (October-December) can potentially be found in the TMAA depending on the time of year.

Counts conducted in 2004 of males at Pribilof Island rookeries yielded a total 9,978 (Table 2 in National Marine Fisheries Service, 2006). Assuming an even distribution of fur seals throughout the GOA, and using a similar method as for other pinnipeds, the number of male fur seals was multiplied by the percent area of the TMAA compared to the GOA LME (0.0625) for a total of 624 fur seals. **Density was then calculated as 624 fur seals/87,250 km^2, or 0.0072/km^2, which is applicable for the entire region in September and January through April.** Because some northern fur seal adult males feed near the Kuril Islands, this density is likely an over-estimate.

To determine density for migration time periods when adult female, adult male and non-adult fur seals would be present in the TMAA while enroute to feeding areas (October-December), the total number of fur seals in the eastern Pacific stock (665,550) was multiplied by the percent area of the TMAA compared to the GOA LME (0.0625) for a total of 41,597 fur seals. **Density was then calculated as 41,597 fur seals/87,250 km^2, or 0.4768/km^2. This density is applicable for the entire TMAA for October-December.** Because this number includes pups of the year and first year mortality due to predation and other factors is very high, the density is very likely an over-estimate.

To account for migration time periods when adult females would be migrating north thru the TMAA enroute to the rookeries (May-June), the number of pups born (2006 Pribilof Islands and Bogoslof Island count= 147,900; Angliss and Allen, 2009) was used to estimate the number of adult females (assuming all adult females birthed a pup). Assuming an even distribution of fur seal females as they migrate through the GOA, the number of female fur seals was multiplied by the percent area of the TMAA compared to the GOA LME (0.0625) for a total of 9,244 fur seals**. Density was then calculated as 9,244 fur seals/87,250 km^2, or 0.1059/km^2. This density is applicable for the entire** TMAA **for May-June.**

In most years, northern fur seals would not be expected in the GOA in July and August, because adults would still be in the rookeries and non-adults would be foraging farther south, so density would be zero.

Acoustic modeling was calculated for two seasons, warm (June-October) and cold (November-May) water. Northern fur seal densities were therefore averaged to these two seasons by summing monthly densities and dividing by the number of months in each season (Table 5). **The warm water density for northern fur seals was 0.1180/km^2 and the cold water density was 0.1555/km^2 (see Table 1), which are applicable to the entire area.**

Northern fur seals feed on small fish and squid in deep water and along the shelf break; deep dives occur on the shelf and feeding probably occurs near the bottom (Gentry, 2002). There have been a few studies of this species' diving habits during feeding and migrating, although there is no information on dive depth distribution. Ponganis et al. (1992) identified two types of northern fur seal dives, shallow (<75 m) and deep (>75 m). Kooyman and Goebel (1986) found that the mean dive depth for seven tagged females was 68 m (range 32-150 m) and the mean maximum depth was 168 m (range 86-207). Sterling and Ream (2004) reported that the mean dive depth for 19 juvenile males was 17.5 m, with a maximum depth attained of 175 m. Diving was deeper in the daytime than during nighttime, perhaps reflecting the different distribution of prey (especially juvenile pollock), and also differed between inner-shelf, mid-shelf, outer-shelf and off-shelf locations. Deeper diving in the Sterling and Ream study tended to occur on-shelf, with shallower diving off-shelf. Diving patterns during migration tended to be shallower, with diving occurring mainly at night (indicating some feeding on vertically migrating prey) and most time during the day in the upper 5 m of the water column (Baker, 2007). **Based on these very limited depth data, the following are very rough order estimates of time at depth: daytime: 74% at <2 m; 26% at 2-260 m; nighttime: 74% at <2 m; 26% at 2-75 m.**

E.4.3 California sea lion, *Zalophus californianus*

California sea lions breed in the Channel Islands in the southern California Bight and south into Baja California. Males will migrate after the breeding season north to near shore waters of Washington, Oregon and British Columbia (some immature males will remain in northern feeding areas year round). Females generally do not migrate as far north as males. California sea lions have been documented at several locations in Alaska (Maniscalco et al., 2004), including southeast Alaska, Kenai Peninsula and as far north and west at St. Paul Island in the Bering Sea. There were a total of 52 animals documented between 1963 and 2003, and they were observed during all seasons of the year. Their presence in the GOA Exercise Area is likely extremely low both due to the extralimital nature of the occurrence and the species preference for near shore habitat. **No density estimate is available (Table 1).**

E.4.4 Northern elephant seal, *Mirounga angustirostris*

The California stock of elephant seals breeds at rookeries located along the California coast. The most recent population estimate (2005) was 124,000 animals, and was based primarily on pup counts and correction factors (Carretta et al., 2009). Only male elephant seals migrate as far north as the GOA during foraging trips, information known from extensive satellite tagging studies (LeBoeuf et al., 1986, 1993, 2000). Adult males are present at the California rookeries from December through February for mating, and again from May to August during molting. The number of males in the population is particularly difficult to estimate because all adult males are generally not present at the rookery at any one time.

Counts of males at rookeries in the Channel Islands and some central California sites in 2005 yielded 3,815 males and juveniles for which sex could not be determined. Some rookeries were not included in this estimate, including a rapidly growing rookery at Piedras Blancas, which in 2007 had an estimated population of 16,000 animals of all age and sex classes (www.elephantseal.org). The California elephant seal population has also been steadily increasing over time (Carretta et al., 2009). To account for males at rookeries not counted and an increase in the population since 2005, the number of males and juveniles reported in the 2009 stock assessment report (3,815) was doubled to 7,630. Using similar methods as described for Steller's, the number of male elephant seals (7,630) was multiplied by percent area of the TMAA compared to the GOA LME (0.0625) for a total of 477 elephant seals. **Density was then calculated as 475 seals/87,250 km^2, or 0.0055/km^2, which is applicable for the entire TMAA for March-April and September-November.** Because all elephant seal adult males are not at-sea at the same time, the density is probably an over-estimate.

As with northern fur seals, elephant seal densities were averaged to warm (June-October) and cold (November-May) water seasons to provide data suitable for acoustic modeling. To do so, monthly densities were summer and divided by the number of months in each season (Table 5). **The warm water density for elephant seals was 0.0022/km^2 and the cold water density was 0.0023/km^2 (see Table 1, which is applicable to the entire area.**

Elephant seals feed on deep-water squid and fish, and likely spend about 80% of their annual cycle at sea feeding (Hindell, 2002). There has been a disproportionate amount of research done in the diving capabilities of northern elephant seals. Breeding and molting beaches are all located in California and Baja California, and elephant seals are relatively easy to tag (compared to cetaceans) when they are hauled out on the beach; the tag package can be retrieved when the animal returns to shore rather than relying on finding it in the ocean. They are deep divers, and have been tracked to depths >1000 m, although mean depths are usually around 400-600 m. Elephant seals have more than one dive type, termed Types A-E, including rounded and squared-off U-shape, V-shape and others. Particular dive types appear to be used mainly during transit (Types A and B), "processing" of food (Type C), and foraging (Types D and E; Crocker et al., 1994). Asaga et al. (1994) collected dive information on three female seals and provided summary statistics for three dive types. Davis et al. (2001) recorded the diving behavior of a seal returning to the beach, and demonstrated transit depths averaging 186 m with range of depth from 8 m to 430 m. LeBoeuf et al. (1986; 1988), Stewart and DeLong (1993) and LeBoeuf (1994) provided histograms of dives per depth range for tagged females. LeBoeuf et al. (2000; 1988) and LeBoeuf (1994) provided details on foraging trips for males and females offshore California, including information on percentage of time at surface. Hassrick et al. (2007) noted that larger animals (adult males) exhibited longer bottom times and that surface swimming was not noted in the sixteen elephant seals that they tagged. Hindell (2002) noted that traveling likely takes place at depths >200m.

Even with this abundance of information, the numerous types of dives and lack of clear-cut depth distribution data means that the percentage of time at depth needs to be estimated. The closest information provided is from Asaga et al. (1994), which was used here. Note that this information is representative of type D foraging dives of female only. This is the type of dive that would be likely of an elephant seal at-sea. Summary stats from Table 17.3 (Asaga et al., 1994) were used; the data were collected from females

only but will be applied to both sexes and all age classes due to lack of other concise data. Mean dive duration and mean surface intervals were added together to come up with total dive cycle in minutes. Amount of time to traverse from surface to bottom and bottom to surface was calculated by subtracting bottom time (given) from dive duration. Values for total cycle, surface interval, bottom time and descent/ascent were then averaged for all three females. Roundtrip surface to bottom and back averaged 12.9 minutes. Assuming a mean rate of descent/ascent over 527 m (average mean dive depth for all three females combined), the average rate per 100 m was 2.4 min. **Based on these averaged numbers, the following are estimates of time at depth: 9% at <2 m, 11% at 2-100 m, 11% at 101-200 m, 11% at 201-300 m, 11% at 301-400 m, 11% at 401-500 m and 36% at >500 m.**

E.4.5 Harbor seal, *Phoca vitulina*

Harbor seals are distributed throughout coastal areas of the North Pacific. Their distribution is largely tied to suitable beaches for hauling out, pupping and molting, and areas offering good foraging and protection from predators such as killer whales. Most harbor seals are non-migratory. Satellite-tracking studies of movements of adults and pups near Kodiak Island and elsewhere in the GOA indicate that mean distance between haul out and at-sea foraging was 10-25 km for juveniles and 5-10 km for adults (e.g., Lowry et al., 2001; Rehberg and Small, 2001), and nearly all locations were in water <200 m deep, with an apparent preference for depths 20-100 m (Frost et al., 2001). The coastal distribution and limitation to shallower depths make it likely that harbor seals would not be within the TMAA; **there is no density for this species (Table 1).**

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Table E-6. Summary of Marine Mammal Depth and Diving Information for Species Found in the TMAA

NOTE: some species that are not endemic to GOA are included in this appendix because data on their depth and diving preferences were extrapolated to GOA species.

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
MYSTICETES - Baleen whales									
Fin whale	Planktonic crustaceans, including *Thyanoessa* sp and *Calanus* sp, as well as scholling fishes such as capelin (*Mallotus*), herring (*Clupea*) and mackerel (*Scomber*)	Pelagic with some occurrence over continental shelf areas, including in island wake areas of Bay of Fundy	Aguilar (2002); Croll et al. (2001); Acevado et al. (2002): Notarbartolo-di-Sciara et al. (2003); Bannister (2002); Johnston et al. (2005); Watkins and Schevill (1979)	Feeding at depth	Northeast Pacific (Mexico, California)	Mean depth 98 +- 33 m; mean dive time 6.3+- 1.5 min		Fifteen whales/ April-October/Time-depth-recorder	Croll et al. (2001)
Fin whale				Non-feeding	Northeast Pacific (Mexico, California)	Mean depth 59 +-30 m; mean dive time 4.2 +- 1.7 min; most dives to ~ 30 m with occasional deeper V-shaped dives to >90 m		Fifteen whales/ April-October/Time-depth-recorder	Croll et al. (2001)
Fin whale				Feeding	Mediterranean (Ligurian Sea)	Shallow dives (mean 26-33 m, with all <100m) until late afternoon; then dives in excess of 400 m (perhaps to 540 m); in one case a whale showed deep diving in midday; deeper dives probably were to feed on specific prey (*Meganyctiphanes norvegica*) that undergo diel vertical migration		Three whales/ Summer/ Velocity-time-depth-recorder	Panigada et al. (1999); Panigada et al. (2003); Panigada et al. (2006)
Fin whale				Traveling	Mediterranean (Ligurian Sea)	Shallow dives (mean 9.8 +- 5.3 m, with max 20 m) , shorter dive times and slower swimming speed indicate travel mode; deep dives (mean 181.3 +- 195.4 m, max 474 m), longer dive times and faster swimming speeds indicate feeding mode		One whale/ Summer/ Velocity-time-depth-recorder	Jahoda et al. (1999)
Fin whale				Feeding	Northeast Pacific (Southern California Bight)	Mean dive depth 248+-18 m; total dive duration mean 7.0+-1.0 min with mean descent of 1.7+-0.4 min and mean ascet of 1.4+-0.3 min; 60% (i.e., 7.0 min) of total time spent diving with 40% (i.e., 4.7 min) total time spent near sea surface (<50m)	44% in 0-49m (includes surface time plus descent and ascent to 49 m); 23% in 50-225 m (includes descent and ascent times taken from Table 1 minus time spent descending and ascending through 0-49 m); 33% at >225 m (total dive duration minus surface, descent and ascent times)	Seven whales/ August/ Bioacoustic probe	Goldbogen et al. (2006)
Fin whale				Feeding	Northeast Pacific (Southern California Bight)	Distribution of foraging dives mirrored distribution of krill in water collumn, with peaks at 75 and 200-250 m.		Two whales/ September-October/ Time-depth-recorder	Croll et al. (2001)

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
Minke whale	Regionally dependent; can include euphausiids, copepods, small fish and squids; Japanese anchovy preferred in western North Pacific, capelin and krill in the Barents Sea; armhook squids in North Pacific	Coastal, inshore and offshore; known to concentrate in areas of highest prey density, including during flood tides	Perrin and Brownell (2002); Jefferson et al. (1993); Murase et al. (2007); Bannister (2002); Lindstrom and Haug (2001); Johnston et al. (2005); Hoelzel et al. (1989); Haug et al. (2002); Haug et al. (1995); Haug et al. (1996); Konishi and Tamura (2007); Clarke (1986)	Feeding, Searching	North Atlantic (Norway)	Searching for capelin at less than 20 m, then lunge-feeding at depths from 15 to 55 m, then searching again at shallower depths	Based on time series in Figure 2, 47% of time was spent foraging from 21-55 m; 53% of time was spent searching for food from 0-20 m	One whale/ August/ Dive-depth-transmitters	Blix and Folkow (1995)
Minke whale				Feeding	North Pacific (San Juan Islands)	80% of feeding occurred over depths of 20-100m; two types of feeding observed both near surface - lunge feeding and bird association		23 whales/ June-September/ behavioral observations	Hoelzel et al. (1989)
Humpback whale	Pelagic schooling euphausiids and small fish including capelin, herring, mackerel, croaker, spot, and weakfish	Coastal, inshore, near islands and reefs, migration through pelagic waters	Clapham (2002); Hain et al. (1995); Laerm et al. (1997); Bannister (2002); Watkins and Schevill (1979)	Feeding	North Atlantic (Stellwagen Bank)	Depths <40 m		Several whales/ August/ Visual Observations	Hain et al. (1995)
Humpback whale				Feeding (possible)	Tropical Atlantic (Bermuda)	Dives to 240 m		One whale/ April/ VHF tag	Hamilton et al. (1997)
Humpback whale				Feeding (in breeding area)	Tropical Atlantic (Samana Bay - winter breeding area)	Not provided; lunge feeding with bubblenet		One whale/ January/ Visual observations	Baraff et al. (1991)
Humpback whale				Breeding	North Pacific (Hawaii)	Depths in excess of 170 m recorded; some depths to bottom, others to mid- or surface waters; dive duration was not necessarily related to dive depth; whales resting in morning with peak in aerial displays at noon	40% in 0-10 m, 27% in 11-20 m, 12% in 21-30 m, 4% in 31-40 m, 3% in 41-50 m, 2% in 51-60 m, 2% in 61-70 m, 2% in 71-80 m, 2% in 81-90 m, 2% in 91-100 m, 3% in >100 m (from Table 3)	Ten Males/ February-April/ Time-depth-recorder	Baird et al. (2000); Helweg and Herman (1994)
Humpback whale				Feeding	Northeast Atlantic (Greenland)	Dive data was catalogued for time spent in upper 8 m as well as maximum dive depth; diving did not extend to the bottom (~1000 m) with most time in upper 4 m of depth with few dives in excess of 400 m	37% of time in <4 m, 25% of time in 4-20 m, 7% of time in 21-35m, 4% of time in 36-50 m, 6% of time in 51-100 m, 7% of time in 101-150 m, 8% of time in 151-200 m, 6% of time in 201-300 m, and <1% in >300 m	Four whales/ June-July/ Satellite transmitters	Dietz et al. (2002)
Humpback whale				Feeding	North Pacific (Southeast Alaska)	Dives were short (<4 min) and shallow (<60 m); deepest dive to 148m; percent of time at surface increased with increased dive depth and with dives exceeding 60 m; dives related to position of prey patches		Several whales/ July-September/ Passive sonar	Dolphin (1987); Dolphin (1988)

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
Gray whale	Amphipods, including *Ampelisca* sp, and other organisms living in the sea floor; also occasionally surface skim and engulfing; dependent on location; euphausiids along frontal systems may also be important	Continental shelf, 4-120 m depth	Dunham and Duffus (2002); Jones and Swartz (2002); Bannister (2002); Yazvenko et al. (2007); Bluhm et al. (2007)	Migrating	Northeast Pacific (coastal Baja California to northern California)	30 of 36 locations in depths <100m deep (mean 39 m); consistent speed indicating directed movement		One whale/ February/ Satellite tag	Mate and Urban Ramirez (2003)
Gray whale				Feeding	Bering and Chukchi Seas	Depths at feeding locations from 5-51 m depth		Several whales/ July-November/ Aerial surveys and benthic sampling	Clarke et al. (1989); Clarke and Moore (2002); Moore et al. (2003)
Gray whale				Feeding	Northeast Pacific (Kodiak Island)	Feeding on cumacean invertebrates		Several whales/ Year-round/ Aerial surveys	Moore et al. (2007)
Gray whale				Feeding	Northeast Pacific (Vancouver Island)	Majority of time was spent near the surface on interventilation dives (<3 m depth) and near the bottom (extremely nearshore in a protected bay with mean dive depth of 18 m, range 14-22 m depth; little time spent in the water column between surface and bottom.	40% of time at <4 m (surface and interventilation dives), 38% of time at 3-18 m (active migration), 22% of time at >18 m (foraging).	One whale/ August/ Time-depth recorder	Malcolm et al. (1995/96); Malcolm and Duffus (2000)
ODONTOCETES - Toothed whales									
Sperm whale	Squids and other cephalopods, demersal and mesopelagic fish; varies according to region	Deep waters, areas of upwelling	Whitehead (2002); Roberts (2003); Clarke (1986)	Feeding	Mediterranean Sea	Overall dive cycle duration mean = 54.78 min, with 9.14 min (17% of time) at the surface between dives; no measurement of depth of dive		16 whales/ July-August/ visual observations and click recordings	Drouot et al. (2004)
Sperm whale				Feeding	South Pacific (Kaikoura, New Zealand)	83% of time spent underwater; no change in abundance between summer and winter but prey likely changed between seasons		>100 whales/ Year-round/ visual observations	Jacquet et al. (2000)
Sperm whale				Feeding	Equatorial Pacific (Galapagos)	Fecal sampling indicated four species of cephalopods predominated diet, but is likely biased against very small and very large cephalopods; samples showed variation over time and place		Several whales/ January-June/ fecal sampling	Smith and Whitehead (2000)
Sperm whale				Feeding	Equatorial Pacific (Galapagos)	Dives were not to ocean floor (2000-4000 m) but were to mean 382 m in one year and mean of 314 in another year; no diurnal patterns noted; general pattern was 10 min at surface followed by dive of 40 min; clicks (indicating feeding) started usually after descent to few hundred meters		Several whales/ January-June/ acoustic sampling	Papastavrou et al. (1989)
Sperm whale				Feeding	North Pacific (Baja California)	Deep dives (>100m) accounted for 26% of all dives; average depth 418 +- 216 m; most (91%) deep dives were to 100-500 m; deepest dives were 1250-1500m; average dive duration was 27 min; average surface time was 8.0; whale dives closely correlated with depth of squid (200-400 m) during day; nighttime squid were shallower but whales still dove to same depths	74% in <100 m; 24% in 100-500 m; 2% in >500m	Five whales/ October-November/ Satellite-linked dive recorder	Davis et al. (2007)

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
Sperm whale				Resting/ socializing	North Pacific (Baja California)	Most dives (74%) shallow (8-100 m) and short duration; likely resting and/or socializing		Five whales/ October-November/ Satellite-linked dive recorder	Davis et al. (2007)
Sperm whale				Feeding	North Atlantic (Norway)	Maximum dive depths near sea floor and beyond scattering layer		Unknown # male whales/ July/ hydrophone array	Wahlberg (2002)
Sperm whale				Feeding	North Pacific (Southeast Alaska)	Maximum dive depth if 340 m when fishing activity was absent; max dive depth during fishing activity was 105 m		Two whales/ May/ acoustic monitoring	Tiemann et al. (2006)
Sperm whale				Feeding	Northwest Atlantic (Georges Bank)	Dives somewhat more U-shaped than observed elsewhere; animals made both shallow and deep dives; average of 27% of time at surface; deepest dive of 1186 m while deepest depths in area were 1500-3000 m so foraging was mid-water column; surface interval averaged 7.1 min		Nine Whales/ July 2003/ DTAG	Palka and Johnson (2007)
Sperm whale				Feeding	Northwest Atlantic (Georges Bank)	37% of total time was spent near surface (0-10m); foraging dive statistics provided in Table 1 and used to calculate percentages of time in depth categories, adjusted for total time at surface	48% in <10 m; 3% in 10-100 m; 7% in 101-300 m; 7% in 301-500 m; 4% in 501-636 m; 31% in >636 m	Six females or immatures/ September-October/ DTAG	Watwood et al. (2006)
Sperm whale				Feeding	Mediterranean Sea	20% of total time was spent near surface (0-10m); foraging dive statistics provided in Table 1 and used to calculate percentages of time in depth categories, adjusted for total time at surface	35% in <10 m; 4% in 10-100 m; 9% in 101-300 m; 9% in 301-500 m; 5% in 501-623 m; 38% in >636 m	Eleven females or immatures/ July/ DTAG	Watwood et al. (2006)
Sperm whale				Feeding	Gulf of Mexico	28% of total time was spent near surface (0-10m); foraging dive statistics provided in Table 1 and used to calculate percentages of time in depth categories, adjusted for total time at surface	41% in <10 m; 4% in 10-100 m; 8% in 101-300 m; 7% in 301-468 m; 40% >468 m	20 females or immatures/ June-September/ DTAG	Watwood et al. (2006)
Sperm whale				Feeding/ Resting	North Pacific (Japan)	Dives to 400-1200 m; active bursts in velocity at bottom of dive suggesting search-and-pursue strategy for feeding; 14% of total time was spent at surface not feeding or diving at all, with 86% of time spent actively feeding; used numbers from Table 1 to determine percentages of time in each depth category during feeding then adjusted by total time at surface	31% in <10 m (surface time); 8% in 10-200 m; 9% in 201-400 m; 9% in 401-600 m; 9% in 601-800m; 34% in >800 m	One female/ June/ Time-depth-recorder	Amano and Yoshioka (2003)
Sperm whale				Feeding	North Pacific (Japan)	Diel differences in diving in one location offshore Japan, with deeper dives (mean 853 m) and faster swimming during the day than at night (mean 469 m); other location along Japan's coast showed no difference between day and night dives; most time (74%) spent on dives exceeding 200 m; surface periods of 2.9 h at least once per day; max depth recorded 1304 m		Ten whales/ May-June, October/ depth data loggers and VHF radio transmitters	Aoki et al. (2007)

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
Sperm whale				Feeding/ Resting	North Atlantic (Caribbean)	Whales within 5 km of shore during day but moved offshore at night; calves remained mostly at surface with one or more adults; night time tracking more difficult due to increased biological noise from scattering layer; both whales spent long periods of time (>2hr) at surface during diving periods		Two whales/ October/ Acoustic transponder	Watkins et al. (1993)
Sperm whale					North Atlantic (Caribbean)	Dives did not approach bottom of ocean (usually >200 m shallower than bottom depth); day dives deeper than night dives but not significantly; 63% of total time in deep dives with 37% of time near surface or shallow dives (within 100 m of surface)		One whale/ April/ Time-depth tag	Watkins et al. (2002)
Sperm whale				Feeding	Northern Pacific (Hawaii)	Cephalopods of several genera recovered		Two animals/ unknown/ stomach contents	Clarke and Young (1998)
Sperm whale				Occurrence	Mediterranean Sea (Alborian Sea south of Spain)	Preferred waters >700m		Vessel transects	Canadas et al. (2002)
Sperm whale				Feeding	Arctic Ocean (Norway)	Dives from 14-1860 m with median of 175 m; clicking (searching for prey) began at 14-218 m and stopped at 1-1114 m, and whale spent 91% of overall dives emitting clicks; shallower dives were apparently to target more sparse prey while deep dives led to frequent prey capture attempts and were likely within denser food layers		Four adult males/ July/ DTAG	Teloni et al. (2007)
Cuvier's beaked whale	Meso-pelagic or deep water benthic organisms, particularly squid (Cephalapoda: Teuthoidea); may have larger range of prey species than other deep divers; likely suction feeders based on lack of teeth and enlarged hyoid bone and tongue muscles	Offshore, deep waters of continental slope (200-2000 m) or deeper	Heyning (2002); Santos et al. (2001); Blanco and Raga (2000); Clarke (1986)	Feeding	Northeast Pacific (Hawaii)	Max dive depth = 1450 m; identified at least three dive categories including inter-ventilation (<4 m, parabolic shape), long duration (>1000m, U-shaped but with inflections in bottom depth), and intermediate duration (292-568 m, U-shaped); dive cycle usually included one long duration per 2 hours; one dive interval at surface of >65 min; mean depth at taggin was 2131 m so feeding occurred at mid-depths; no difference between day and night diving		Two whales/September-November/Time-depth recorders	Baird et al. (2006a); Baird et al. (2005a)
Cuvier's beaked whale				Feeding	Mediterranean (Ligurian Sea)	Two types of dive, U-shaped deep foraging dives (>500 m, mean 1070 m) and shallower non-foraging dives (<500 m, mean 221 m); depth distribution taken from information in Table 2	27% in <2 m (surface); 29% in 2-220 m; 4% in 221-400 m; 4% in 401-600 m; 4% in 601-800 m; 5% in 801-1070; 27% in >1070 m	Seven whales/ June/ DTAGs	Tyack et al. (2006)
Cuvier's beaked whale				Feeding	Mediterranean (Ligurian Sea)	Deep dives broken into three phases: silent descent, vocal-foraging and silent ascent; vocalizations not detected <200m depth; detected when whales were as deep as 1267 m; vocalizations ceased when whale started ascending from dive; clicks ultrasonic with no significant energy below 20 kHz		Two whales/ September/ DTAGs	Johnson et al. (2004); Soto et al. (2006)

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Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
Baird's beaked whale	Benthic fishes and cephalopods, also pelagic fish including mackerel and sardine; primarily squid off northern coast of Hokkaido and deep sea fish off Pacific coast of Japan	Deep waters over continental slope	Kasuya (2002); Kasuya (1986); Walker et al. (2002); Clarke (1986)	Feeding	Northwest Atlantic (Japan)	Whales caught at depths of ~1000 m; stomach contents included prey species normally found from 1100-1300 m; likely feeding at or near bottom		Several whales/ August-September/ Stomach contents	Ohizumi et al. (2003)
Northern bottlenose whale	Squid of genus *Gonatus* and *Taonius* and occasionally fish and benthic invertebrates	Deep waters >500 m; can dive to >1400 m	Gowans (2002); Kasuya (2002); Clarke and Kristensen (1980); Clarke (1986)	Feeding	Northeast Atlantic (Nova Scotia "Gully")	Most (62-70%, average = 66%) of the time was spent diving (deeper than 40 m); most dives somewhat V-shaped; shallow dives (<400 m) and deep dives (>800 m); whales spent 24-30% (therefore, average of 27%) of dives at 85% maximum depth indicating they feed near the bottom; deepest dive 1453 m; depth distribution taken from info in Table 1	34% at 0-40 m, 39% at 41-800 m, 27% at >800 m	Two whales/ June-August/ Time-depth recorders	Hooker and Baird (1999)
Killer whale	Diet includes fish (salmon, herring, cod, tuna) and cephalopods, as well as other marine mammals (pinnipeds, dolphins, mustelids, whales) and sea birds; most populations show marked dietary specialization	Widely distributed but more commonly seen in coastal temperate waters of high productivity	Ford (2002); Estes et al. (1998); Ford et al. (1998); Saulitis et al. (2000); Baird et al. (2006b)	Feeding	North Pacific (Puget Sound)	Resident-type (fish-eater) whales; maximum dive depth recorded 264 m with maximum depth in study area of 330 m; population appeared to use primarily near-surface waters most likely because prey was available there; some difference between day and night patterns and between males and femalesl depth distribution info from Table 5 in Baird et al. (2003)	96% at 0-30 m; 4% at >30 m	Eight whales/ Summer-fall/ Time-depth recorders	Baird et al. (2005b); Baird et al. (2003)
Killer whale				Feeding	Southwest Atlantic (Brazil)	Small to medium-sized cephalopods, both offshore and coastal		Unknown animals/ unknown/ stomach contents	Santos and Haimovici (2001)
Killer whale				Feeding	North Pacific	Offshore type whales, likely fish eaters based on behavioral observations and stomach content analysis		Several/ Year round/ Observations and stomach contents	Dahlheim et al. (2008)
Pacific white-sided dolphin	Lanternfish, anchovies, hake and squid; also herring, salmon, cod, shrimp and capelin	Mostly pelagic and temperate; may syncrhonize movements with anchovy and other prey	van Waerebeek and Wursig (2002); Clarke (1986)	Feeding	Northeast Pacific (British Columbia inland waters)	Prey collected included herring, capelin, Pacific sardine and possibly eulachon		Unknown/ year round/ dipnet collection of prey	Morton (2000)
Atlantic white-sided dolphin	Herring, small mackerel, gadid fishes, smelts, hake, sand lances, squid; likely change from season to season	Continental shelf and slope from deep oceanic areas to occasionally coastal waters	Cipriano (2002); Clarke (1986)		North Atlantic (Gulf of Maine)	Most (89%) of time spent submerged; most (76%) dives were <1 min duration and none were for longer that 4 minute duration		One animal/ February/ satellite-monitored radio tag	Mate et al. (1994)
Atlantic white-sided dolphin				Feeding	North Atlantic (Ireland)	Most frequent prey were mackerel and silvery pout		Four animals/ year round/ stomach contents	Berrow and Rogan (1996)
White-beaked dolphin	Mesopelagic fish, especially cod, whiting and other gadids, and squid		Kinze (2002); Clarke (1986)	Feeding	North Atlantic (Ireland)	Stomach contained Gadoid fish and scad remains		One animal/ year round/ stomach contents	Berrow and Rogan (1996)
Dall's porpoise	Small schooling and mesopelagic fish and cephalopods	Deep offshore as well as deeper near shore waters; diurnal as well as nocturnal feeders to take advantage of prey availability	Jefferson (2002), Amano et al. (1998); Clarke (1986)	Travelling	North Pacific (Puget Sound)	Feasibility study to determine if Dall's could be successfully tagged with suction cup tag; depth distribution info from Table 2 and excludes initial dive data when animal responded to tag event	39% at <1 m, 8% at 1-10 m, 45% at 11-40 m and 8% at >40 m	One animal/ August/ time-depth recorder	Hanson and Baird (1998)

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
PINNIPEDS									
Northern fur seal	Small fish and squid in deep water and along the shelf break; Pacific herring, squid and walleye pollock dominated in the Gulf of Alaska, British Columbia, Washington and Oregon; northern anchovy and squid primary in Oregon, Washington and California	Deep dives occur on the shelf and feeding probably occurs near the bottom	Gentry (2002); Ream et al. (2005)			Maximum dive depth 256 m		Two females/ July/ time-depth recorders	Ponganis et al. (1992)
Northern fur seal				Feeding	North Pacific (Bering Sea)	Mean dive depth 68 m (range 32-150 m); mean maximum depth 168 m (range 86-207 m); two types of dives, shallow (<75 m; mean = 30 m; occur at night) and deep (>75 m; mean = 130 m; occur during day and night); total activity budget during feeding trips was 57% active at surface, 26% diving and 17% resting; depth distribution info from Gentry and others	Daytime: 74% at <2 m, 24% at 2-260 m; night time: 74% at <2 m, 24% at 2-75 m	Seven females/ July/ time-depth recorders	Gentry et al. (1986)
Northern fur seal				Feeding	North Pacific (Bering Sea)	Mean dive depth of 17.5 m, with a maximum depth of 175 m; diving deeper in the daytime than during nighttime, perhaps reflecting the different distribution of prey (especially juvenile pollock) that undertake night time vertical migrations, and also differed between inner-shelf, mid-shelf, outer-shelf and off-shelf locations; deeper diving tended to occur on-shelf, with shallower diving off-shelf.		19 juvenile males/ July-September/ satellite transmitters	Sterling and Ream (2004)
Northern fur seal				Feeding	North Pacific (Bering Sea to California)	Higher dive rates during night time hours compared with daytime; variation in mean dive depth between migratory travelling and destination area (eastern North Pacific coast) where mean dive depth was <25 m; night time mean dive depths were greater during full moon than during new moon		Three females/ November-May/ satellite transmitters	Ream et al. (2005)
Northern fur seal				Feeding	North Pacific (Bering Sea)	Activity budgets of lactating females of 44% locomoting, 23% diving and 33% resting at the surface		Four females/ August/ platform terminal transmitters	Insley et al. (2008)
Northern fur seal				Migrating	North Pacific (Bering Sea to Gulf of Alaska)	Diving behavior consistent regardless of habitat (pelagic or continental shelf); diving largely at night and in evening and morning with little diving during day suggesting feeding on vertically migrating prey	71% at <2 m, 14% at 2-5 m, 5% at 6-10 m, 6% at 11-25 m and 3% at 26-50 m	20 post-weaning pups/ November-May/ satellite-linked time-depth recorders	Baker (2007)

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
Steller sea lion	Fish, including walleye pollock, Pacific herring, sand lance, salmon, flounder, rockfish and cephalopods	Diets and feeding patterns change with seasons; population levels are related to prey with increasing populations correlated with diverse diets and decreasing populations correlated with diets of primarily one prey item; females feed mostly at night during breeding season; feeding occurs throughout the day during non-breeding season	Trites et al. (2007); Loughlin (2002); Merrick et al. (1994)	Feeding	North Pacific (southeast Alaska)	Characterized by relatively brief trips to sea that represent about on-half of total time, and by fairly frequent, short and shallow dives that occur mostly at night. Maximum depth recorded was 424 m; mean depth was 26.4 m, and 49% of all dives were <10 m.		13 females/ May-June, January/ satellite-linked time-depth recorders	Swain (1996)
Steller sea lion				Feeding	North Pacific (Gulf of Alaska)	Adult females forage close to land in summer (<20 km) and make brief trips (<2 days) and shallow dives (<30 m); in winter, divers are longer in distance (up to 300 km), time (up to several months) and deeper (>250 m), Average dive depth of 36.5 and 42.9 m		Two females/ unknown/ satellite-linked time-depth recorder	Merrick et al. (1994)
Steller sea lion					North Pacific (Gulf of Alaska)	Adult females capable of foraging throughout GOA and Bering Sea, while young-of-year have smaller ranges and shallower dives; females in winter dove deepest (median 24 m, maximum >250 m, while young-of-year were shallowest (median 9 m, max 72 m); depth distribution taken from Figure 4 and represent averaging of all age/season classes	60% at 0-10 m, 22% at 11-20 m, 12% at 21-50 m, 5% at 51-100 m and 1% at >100 m.	15 animals/ June-July, November-March/ satellite-linked time-depth recorders and VHF transmitters	Merrick and Loughlin (1997)
Steller sea lion					North Pacific (Gulf of Alaska)	Young of year dove for shorter periods and shallower depths than yearlings; maximum dive depth was 288 m; long-range transits began at >10 months of age; depth distribution taken from Figure 2	78% in 0-10 m, 13% in 11-20 m, 7% in 21-50 m, and 2% in > 51 m	18 animals/ October-June/ satellite-linked time-depth recorders	Loughlin et al. (2003)
Steller sea lion					North Pacific (Washington)	Maximum dive depth was 328 m; depth distribution taken from Figure 2	28% in 0-10 m, 30% in 11-20 m, 18% in 21-50 m, 14% in 51-100 m and 10% in >100 m	Seven animals/ October-June/ satellite-linked time-depth recorders	Loughlin et al. (2003)
Steller sea lion					North Pacific (Gulf of Alaska)	Juveniles from western Alaska rookeries left on foraging trips at dusk and returned at dawn (taking advantage of polluck that vertically migrates and hauling out during the day), while juveniles from eastern Alaska rookeries left on foraging trips throughout the day and night, likely feeding on prey other than vertical migrants		129 animals/ August-November, January-May/ satellite dive recorders	Call et al. 2007)
Steller sea lion					North Pacific (Gulf of Alaska)	Round trip distance and duration of pups and juveniles increased with age, trip distance was greater for western rookeries than for eastern rookeries, trip duration was greater for females than males; 90% of trips were <=15 km from haul-outs; dispersals >500 km were undertaken only by males although dispersals of >120 km were common.		103 animals/ year round/ satellite dive recorders	Raum-Suryan et al. (2004)

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
Northern elephant seal	Feed on deep-water squid and fish, and likely spend about 80% of their annual cycle at sea feeding; feed in meso-pelagic zone on vertically migrating squid	Deeper waters (>1000 m); males farther north than females	Hindell (2002); Stewart and DeLong (1993; 1995); LeBoeuf et al. (1988); Asaga et al. (1994); LeBoeuf (1994)	Feeding	North Pacific	Dive continuously for 8-10 months/year; dispersion and migratory patterns related to oceanographic features and areas of biological productivity; primarily squid eaters; males travel farther than females; females submerged 91% and males submerged 88% of time at sea; dive continuously; average depth for females was 479 m (post-moult) and 518 m (post-breeding) and for males 364 m (post-breeding) and 366 m (post-moult)		36 adults (both sexes)/ February-August/ dive and location recorders	Stewart and Delong (1993)
Northern elephant seal				Feeding	North Pacific	seals use same foraging areas during post-breeding and post-moulting periods; sexes are segregated geographically		36 adults (both sexes)/ January-February; May; July/ geographic location time depth recorders	Stewart and DeLong (1995)
Northern elephant seal				Feeding	North Pacific	little time at depths <200 m or >800 m; post-breeding migration is directed northward and quick until feeding areas are obtained; dives in transit are shallower than those on foraging grounds		14 adults (both sexes)/ February-July/ geographic location time depth recorders	Stewart and DeLong (1994)
Northern elephant seal				Feeding	North Pacific	Sea surface temperature appears to influence female forage area choice; foraging occurred in near shore areas of Gulf of Alaska, offshore Gulf of Alaska, near shore off Washington and Oregon and offshore between 40 and 50 N		12 adult females/ year round/ time depth recorders	Simmins et al. (2007)
Northern elephant seal				Feeding	North Pacific	Post-lactation monitoring; 86% of time at-sea spent submerged; maximum dive of 894 m, but dives >700 m were rare; modal dive depths between 350 and 650 m; continuous deep diving while at-sea; night dives were more numerous, shallower and of shorter duration; most dives types D (deep and u-shaped)		Seven adult females/ February-March/ time-depth recorders	LeBoeuf et al. (1988)
Northern elephant seal				Feeding	North Pacific	Mean depth of dive 333 m; maximum dive 630 m; 6% of all dives <200 m		One adult female/ February/ time-depth recorder	LeBoeuf et al. (1986)
Northern elephant seal				Feeding	North Pacific	Differences in foraging locations and behavior between males and females; females exhibited pelagic diving with varying dive depths depending on prey location in deep scattering layer; males exhibited pelagic diving as well as flat-bottom benthic dives near continental margins; males migrated to northern Gulf of Alaska and eastern Aleutians with females distributed west to 150 W between 44 and 52 N		32 adults (both sexes)/ March-July/ radio-telemetry	LeBoeuf et al. (1993)
Northern elephant seal				Transiting	North Pacific	90% of time submerged; mean depth 289 m; directed swimming even while submerged used prolonged gliding during dive descents which reduces cost of transport and can increase the duration of the dive		One adult female/ April/ video and satellite telemetry	Davis et al. (2001)

	GENERAL INFORMATION			DEPTH SPECIFIC INFORMATION					
Common Name	**Food Preference**	**Depth or Oceanic Preference**	**References**	**Behavioral State**	**Geographic Region**	**Depth Information**	**Depth Distribution**	**Sample Size/ Time of Year/Method**	**References**
Northern elephant seal				Feeding	North Pacific	Type D (foraging) dives account for 75-80% of all dives; type A (transit dives) rarely occurred in series; type C dives were shallowest; depth distribution information from table 17.3, type D dives which are foraging dives as they are the most common	9% at <2 m, 11% at 2-100 m, 11% at 101-200 m, 11% at 201-300 m, 11% at 301-400 m, 11% at 401-500 m and 36% at >500 m.	Two adult females/ February-May/ time-depth recorders	Asaga et al. (1994)
Northern elephant seal				Feeding	North Pacific	Transit dives in males cover large horizontal distances and are shallower than pelagic dive depths; transit dives in females and juveniles are both for transiting and search for prey patches; foraging dives have steeper angles than transit dives in females, but angles are not noticeably different in juveniles; swim speeds were similar across age and sex		16 animals (various ages)/ April-May/ time-depth recorders and platform terminal transmitters	Hassrick et al. (2007)
Northern elephant seal				Feeding	North Pacific	Males feed primarily from coastal Oregon to western Aleutian Islands, along continental margin and feed primarily on benthic organisms, migration is direct to forage areas across Pacific; females have wider foraging area from 38-60 N and from the coast to 172 E, and forage on pelagic prey in the water column, migration is more variable to take advantage of prey patches		47 adults (both sexes)/ March-June, September-December/ time-depth swim speed recorders	LeBoeuf et al. (2000)
Northern elephant seal				Feeding, Transiting	North Pacific	Different types of dives serve three general functions: type AB dives are transit dives (covering great horizontal distance and with shallow ascent and descent angles); type C dives are "processing" dives for internal processes such as digestions (slower swimming speed and short horizontal distance; type DE dives are foraging (both chasing prey pelagically and benthic foraging)		unknown	Crocker et al. (1994)

Appendix F

Cetacean Stranding Report

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F CETACEAN STRANDING REPORT

F.1 CETACEAN STRANDINGS AND THREATS

Strandings can involve a single animal or several to hundreds of animals. An event where animals are found out of their normal habitat may be considered a stranding even though animals do not necessarily end up beaching (such as the July 2004 "Hanalei Mass Stranding Event"; Southall et al., 2006). Several hypotheses have been given for the mass strandings which include the impact of shallow beach slopes on odontocete echolocation, disease or parasites, geomagnetic anomalies that affect navigation, following a food source in close to shore, avoiding predators, social interactions that cause other cetaceans to come to the aid of stranded animals, and human actions. Generally, inshore species do not strand in large numbers but generally just as individual animals. This may be due to their unfamiliarity with the coastal area. By contrast, pelagic species that are unfamiliar with obstructions or sea bottom tend to strand more often in larger numbers (Woodings, 1995). The Navy has studied several stranding events in detail that may have occurred in association with Navy sonar activities. To better understand the causal factors in stranding events that may be associated with Navy sonar activities, the main factors - including bathymetry (i.e. steep drop offs), narrow channels (less than 35 nm), environmental conditions (e.g. surface ducting), and multiple sonar ships (see Section on Stranding Events Associated with Navy Sonar) - were compared among the different stranding events.

F.1.1 What is a Stranded Marine Mammal?

When a live or dead marine mammal swims or floats onto shore and becomes "beached" or incapable of returning to sea, the event is termed a "stranding" (Geraci et al., 1999; Perrin and Geraci, 2002; Geraci and Lounsbury, 2005; NMFS, 2007). The legal definition for a stranding within the U.S. is that "a marine mammal is dead and is (i) on a beach or shore of the United States; or (ii) in waters under the jurisdiction of the United States (including any navigable waters); or (B) a marine mammal is alive and is (i) on a beach or shore of the United States and is unable to return to the water; (ii) on a beach or shore of the United States and, although able to return to the water, is in need of apparent medical attention; or (iii) in the waters under the jurisdiction of the United States (including any navigable waters), but is unable to return to its natural habitat under its own power or without assistance." (16 United States Code [U.S.C.] section 1421h).

The majority of animals that strand are dead or moribund (NMFS, 2007). For animals that strand alive, human intervention through medical aid and/or guidance seaward may be required for the animal to return to the sea. If unable to return to sea, rehabilitation at an appropriate facility may be determined as the best opportunity for animal survival. An event where animals are found out of their normal habitat may be considered a stranding depending on circumstances even though the animals do not necessarily end up beaching (Southall, 2006).

Three general categories can be used to describe strandings: single, mass, and unusual mortality events. The most frequent type of stranding involves only one animal (or a mother/calf pair) (NMFS, 2007).

Mass stranding involves two or more marine mammals of the same species other than a mother/calf pair (Wilkinson, 1991), and may span one or more days and range over several miles (Simmonds and Lopez-Jurado, 1991; Frantzis, 1998; Walsh et al., 2001; Freitas, 2004). In North America, only a few species typically strand in large groups of 15 or more and include sperm whales, pilot whales, false killer whales, Atlantic white-sided dolphins, white-beaked dolphins, and rough-toothed dolphins (Odell 1987, Walsh et al. 2001). Some species, such as pilot whales, false-killer whales, and melon-headed whales occasionally strand in groups of 50 to 150 or more (Geraci et al. 1999). All of these normally pelagic off-shore species are highly sociable and infrequently encountered in coastal waters. Species that commonly strand in smaller numbers include pygmy killer whales, common dolphins, bottlenose dolphins, Pacific white-sided dolphin Frasier's dolphins, gray whale and humpback whale (West Coast only), harbor porpoise, Cuvier's

beaked whales, California sea lions, and harbor seals (Mazzuca et al. 1999, Norman et al. 2004, Geraci and Lounsbury 2005).

Unusual mortality events (UMEs) can be a series of single strandings or mass strandings, or unexpected mortalities (i.e., die-offs) that occur under unusual circumstances (Dierauf and Gulland, 2001; Harwood, 2002; Gulland, 2006; NMFS, 2007). These events may be interrelated: for instance, at-sea die-offs lead to increased stranding frequency over a short period of time, generally within one to two months. As published by the NMFS, revised criteria for defining a UME include (71 FR 75234, 2006):

(1) A marked increase in the magnitude or a marked change in the nature of morbidity, mortality, or strandings when compared with prior records.

(2) A temporal change in morbidity, mortality or strandings is occurring.

(3) A spatial change in morbidity, mortality or strandings is occurring.

(4) The species, age, or sex composition of the affected animals is different than that of animals that are normally affected.

(5) Affected animals exhibit similar or unusual pathologic findings, behavior patterns, clinical signs, or general physical condition (e.g., blubber thickness).

(6) Potentially significant morbidity, mortality, or stranding is observed in species, stocks or populations that are particularly vulnerable (e.g., listed as depleted, threatened or endangered or declining). For example, stranding of three or four right whales may be cause for great concern whereas stranding of a similar number of fin whales may not.

(7) Morbidity is observed concurrent with or as part of an unexplained continual decline of a marine mammal population, stock, or species.

UMEs are usually unexpected, infrequent, and may involve a significant number of marine mammal mortalities. As discussed below, unusual environmental conditions are probably responsible for most UMEs and marine mammal die-offs (Vidal and Gallo-Reynoso, 1996; Geraci et al., 1999; Walsh et al., 2001; Gulland and Hall, 2005).

F.1.2 United States Stranding Response Organization

Stranding events provide scientists and resource managers information not available from limited at-sea surveys, and may be the only way to learn key biological information about certain species such as distribution, seasonal occurrence, and health (Rankin, 1953; Moore et al., 2004; Geraci and Lounsbury, 2005). Necropsies are useful in attempting to determine a reason for the stranding, and are performed on stranded animals when the situation and resources allow.

In 1992, Congress amended the MMPA to establish the Marine Mammal Health and Stranding Response Program (MMHSRP) under authority of the NMFS. The MMHSRP was created out of concern started in the 1980s for marine mammal mortalities, to formalize the response process, and to focus efforts being initiated by numerous local stranding organizations and as a result of public concern.

Major elements of the MMHSRP include (NMFS, 2007):

- National Marine Mammal Stranding Network
- Marine Mammal UME Program

- National Marine Mammal Tissue Bank (NMMTB) and Quality Assurance Program
- Marine Mammal Health Biomonitoring, Research, and Development
- Marine Mammal Disentanglement Network
- John H. Prescott Marine Mammal Rescue Assistance Grant Program (a.k.a. the Prescott Grant Program)
- Information Management and Dissemination.

The United States has a well-organized network in coastal states to respond to marine mammal strandings. Overseen by the NMFS, the National Marine Mammal Stranding Network is comprised of smaller organizations manned by professionals and volunteers from nonprofit organizations, aquaria, universities, and state and local governments trained in stranding response animal health, and diseased investigation. Currently, 141 organizations are authorized by NMFS to respond to marine mammal strandings (National Marine Fisheries Service, 2007o). Through a National Coordinator and six regional coordinators, NMFS authorizes and oversees stranding response activities and provides specialized training for the network.

NMFS Regions and Associated States and Territories

NMFS Northeast Region- ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, VA

NMFS Southeast Region- NC, SC, GA, FL, AL, MS, LA, TX, PR, VI

NMFS Southwest Region- CA

NMFS Northwest Region- OR, WA

NMFS Alaska Region- AK

NMFS Pacific Islands Region- HI, Guam, American Samoa, Commonwealth of the Northern Mariana Islands (CNMI)

Stranding reporting and response efforts over time have been inconsistent, although effort and data quality within the U.S. have been improving within the last 20 years (NMFS, 2007). Given the historical inconsistency in response and reporting, however, interpretation of long-term trends in marine mammal stranding is difficult (NMFS, 2007). Nationwide, between 1995-2004, there were approximately 700-1500 cetacean strandings per year and between 2000-4600 pinniped strandings per year (NMFS, 2007). In Alaska from 2001-2004, there were 45-165 cetacean strandings per year and 58-125 pinniped strandings per year (NMFS, 2007). Detailed regional stranding information including most commonly stranded species can be found in Zimmerman (1991), Geraci and Lounsbury (2005), and NMFS (2007).

F.1.3 Unusual Mortality Events (UMEs)

From 1991 to the present, there have been 45 formally recognized UMEs in the U.S. The UMEs have either involved single or multiple species and dozens to hundreds of individual marine mammals per event (NOAA Fisheries, Office of Protected Resources 2008). Table F-1 contains a list of documented UMEs in and along the Pacific coast of the U.S.

Table F-1. Documented UMEs in the Pacific.

Year	Composition	Determination
2007	Guadeloupe fur seals in the Northwest	Cause not determined
2007	Large whales in California	Human Interaction
2007	Cetaceans in California	Cause not determined
2006	Harbor porpoises in the Pacific Northwest	Cause not determined
2006	Sea otters in Alaska	Cause not determined
2003	Sea otters in California	Ecological Factors
2002	Multiple species (common dolphins, California sea lion, sea otters) in California	Biotoxin
2001-2002	Hawaiian monk seals in the Northwest Hawaiian Islands	Ecological Factors
2000	Harbor seals in California	Infectious disease
2000	California sea lions in California	Biotoxin
1999/2000	Gray whales in California, Oregon and Washington	Cause not determined
1998	California sea lions in California	Harmful algal bloom; Domoic acid
1997	Harbor seals in California	Unknown infectious respiratory disease
1994	Common dolphins in California	Cause not determined
1993	Harbor seals, Steller sea lions, and California sea lions on the central Washington coast	Human Interaction
1992-1993	Pinnipeds in California	Ecological Factors
1991	California sea lions in California	Infectious disease

Source: NOAA Fisheries, Office of Protected Resources 2008

Stranding of cetaceans and pinnipeds reported to NMFS Alaska Region from 1998-2007 are summarized in Table F-2. The southcentral area includes the area from Cape Suckling to Cape Douglas and the Kodiak area follows the boundaries of the Kodiak Borough.

Strandings constituting this record were reported by fishermen, hunters, fishery observers, and other members of the public and include animals found dead (floating and beach-cast) and reports of live stranded, mass stranded, abandoned, sick or injured animals. Strandings where the animal(s) could not be examined are included in the numbers as long as the animal was at least identified as either cetacean or pinniped. Human interactions like ship strike/collisions, fishery interactions and entanglements are also included. Known subsistence takes are not included, but suspected subsistence animals are in some cases included (e.g., animals reported shot). Fishery observer reports are not included unless the animal was observed outside of statistical reporting protocols (and thus would not be included by the observer program as part of their watch data set). (NMFS, Alaska Region, Protected Resources, 2008).

Both unconfirmed and confirmed reports are included. (NMFS, Alaska Region, Protected Resources, 2008). This practice differs somewhat from strandings tabulated in the official record for other regions (such as for the Northwest Region), where a field investigation must confirm the reported stranding, however, Alaska's size, weather conditions, geography, and remote coastlines do not always allow for a field investigation/ confirmation to be a reasonable use of resources.

While the Alaska records could potentially be argued to constitute a variable record based on opportunistic reports, this data collection (sampling) method has been consistent for a decade and therefore constitutes a record that can be compared across reporting years. It is recognized that controls

were not established for other important variables influencing the occurrence of strandings and/or the reporting of strandings (e.g, weather, seismic events, changes in fisheries).

Table F-2. Alaska Region Marine Mammal Strandings

Year	Cetacea – All Areas	Beaked Whales – All Areas	Cetacea – Southcentral and Kodiak Areas	Pinnipedia – All Areas	Pinnipedia – Southcentral and Kodiak Areas
1998 – 2002*	110	8	74	50	25
2003	166	1	131	81	14
2004	62	8	33	59	12
2005	63	2	30	54	20
2006	92	1	34	57	26
2007	63	0	30	54	20

Source: NMFS, Alaska Region, Protected Resources 2004; 2005; 2006; 2007; 2008

Records gathered by Zimmerman (1991) for the period between 1975 and 1987 indicate that 325 stranded cetaceans were reported for the entire state of Alaska. Prior to 1985, a centralized Federal stranding network had not been established, which limited the number of stranding reports recorded. Table F-3 details the most commonly stranded cetaceans in the Gulf of Alaska for that period.

Table F-3. Most Commonly Reported Species of Cetaceans Found Stranded in the Gulf of Alaska 1975 – 1987

Species	Number Stranded
Gray Whale	7
Beluga Whale	20
Stejneger's Beaked Whale	5
Killer Whale	6
Cuvier's Beaked Whale	5
Minke Whale	10
Bowhead Whale	0
Humpback Whale	9
Sperm Whale	4
Baird's Beaked Whale	1
Fin Whale	3
Total	70

Source: Zimmerman, 1991

F.1.4 Threats to Marine Mammals and Potential Causes for Stranding

Reports of marine mammal strandings can be traced back to ancient Greece (Walsh et al., 2001). Like any wildlife population, there are normal background mortality rates that influence marine mammal population dynamics, including starvation, predation, aging, reproductive success, and disease (Geraci et al. 1999; Carretta et al. 2007). Strandings in and of themselves may be reflective of this natural cycle or, more recently, may be the result of anthropogenic sources (i.e., human impacts). Current science suggests that multiple factors, both natural and man-made, may be acting alone or in combination to cause a marine mammal to strand (Geraci et al., 1999; Culik, 2002; Perrin and Geraci, 2002; Hoelzel, 2003; Geraci and Lounsbury, 2005; NRC, 2006). While post-stranding data collection and necropsies of dead animals are attempted in an effort to find a possible cause for the stranding, it is often difficult to pinpoint exactly one factor that can be blamed for any given stranding. An animal suffering from one ailment

becomes susceptible to various other influences because of its weakened condition, making it difficult to determine a primary cause. In many stranding cases, scientists never learn the exact reason for the stranding.

Specific potential stranding causes can include both natural and human influenced (anthropogenic) causes listed below and described in the following sections:

Natural Stranding Causes
- Disease
- Natural toxins
- Weather and climatic influences
- Navigation errors
- Social cohesion
- Predation

Human Influenced (Anthropogenic) Stranding Causes
- Fisheries interaction
- Vessel strike
- Pollution and ingestion
- Noise

F.1.4.1 Natural Stranding Causes

Significant natural causes of mortality, die-offs, and stranding discussed below include disease and parasitism; marine neurotoxins from algae; navigation errors that lead to inadvertent stranding; and climatic influences that impact the distribution and abundance of potential food resources (i.e., starvation). Other natural mortality not discussed in detail includes predation by other species such as sharks (Cockcroft et al., 1989; Heithaus, 2001), killer whales (Constantine et al. 1998; Guinet et al. 2000; Pitman et al. 2001), and some species of pinniped (Hiruki et al. 1999; Robinson et al. 1999).

Disease

Like other mammals, marine mammals frequently suffer from a variety of diseases of viral, bacterial, parasitic, and fungal origin (Visser et al. 1991; Dunn et al. 2001; Harwood 2002). Gulland and Hall (2005) provide a more detailed summary of individual and population effects of marine mammal diseases.

Microparasites such as bacteria, viruses, and other microorganisms are commonly found in marine mammal habitats and usually pose little threat to a healthy animal (Geraci et al. 1999). For example, long-finned pilot whales that inhabit the waters off of the northeastern coast of the U.S. are carriers of the morbillivirus, yet have grown resistant to its usually lethal effects (Geraci et al. 1999). Since the 1980s, however, virus infections have been strongly associated with marine mammal die-offs (Domingo et al., 1992; Geraci and Lounsbury, 2005). Morbillivirus is the most significant marine mammal virus and suppresses a host's immune system, increasing risk of secondary infection (Harwood 2002). A bottlenose dolphin UME in 1993 and 1994 was caused by infectious disease. Die-offs ranged from northwestern Florida to Texas, with an increased number of deaths as it spread (NMFS 2007c). A 2004 UME in Florida was also associated with dolphin morbillivirus (NMFS 2004). Influenza A was responsible for the first reported mass mortality in the U.S., occurring along the coast of New England in 1979-1980 (Geraci et al. 1999; Harwood 2002). Canine distemper virus (a type of morbillivirus) has been responsible for large scale pinniped mortalities and die-offs (Grachev et al. 1989; Kennedy et al., 2000; Gulland and Hall, 2005), while a bacteria, *Leptospira pomona*, is responsible for periodic die-offs in California sea lions about every four years (Gulland et al. 1996; Gulland and Hall 2005). It is difficult to determine whether microparasites commonly act as a primary pathogen, or whether they show up as a secondary infection in

an already weakened animal (Geraci et al. 1999). Most marine mammal die-offs from infectious disease in the last 25 years, however, have had viruses associated with them (Simmonds and Mayer 1997; Geraci et al. 1999; Harwood 2002).

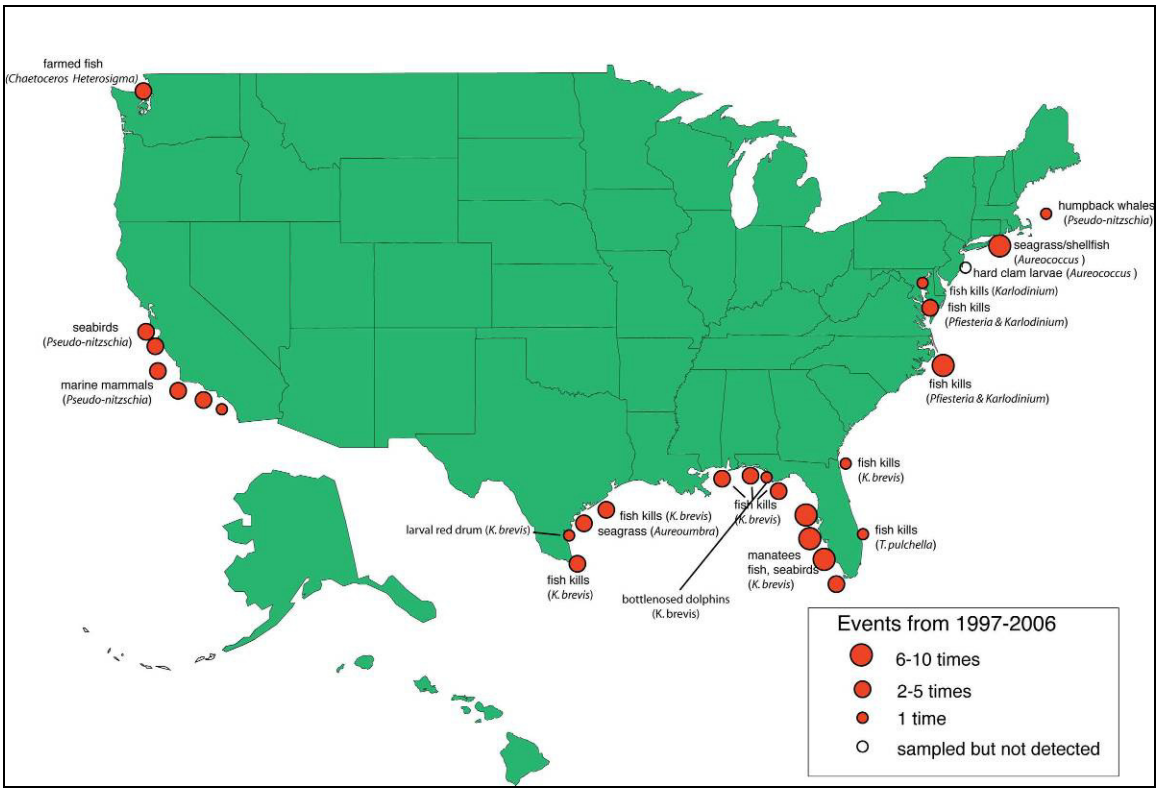
Macroparasites are usually large parasitic organisms and include lungworms, trematodes (parasitic flatworms), and protozoans (Geraci and St. Aubin 1987; Geraci et al. 1999). Marine mammals can carry many different types, and have shown a robust tolerance for sizeable infestation unless compromised by illness, injury, or starvation (Morimitsu et al. 1987; Dailey et al. 1991; Geraci et al., 1999). Nasitrema, a usually benign trematode found in the head sinuses of cetaceans (Geraci et al. 1999), can cause brain damage if it migrates (Ridgway and Dailey 1972). As a result, this worm is one of the few directly linked to stranding in the cetaceans (Dailey and Walker 1978; Geraci et al. 1999).

Non-infectious disease, such as congenital bone pathology of the vertebral column (osteomyelitis, spondylosis deformans, and ankylosing spondylitis [AS]), has been described in several species of cetacean (Paterson 1984; Alexander et al. 1989; Kompanje 1995; Sweeny et al. 2005). In humans, bone pathology such as AS, can impair mobility and increase vulnerability to further spinal trauma (Resnick and Niwayama 2002). Bone pathology has been found in cases of single strandings (Paterson 1984; Kompanje 1995), and also in cetaceans prone to mass stranding (Sweeny et al. 2005), possibly acting as a contributing or causal influence in both types of events.

Naturally Occurring Marine Neurotoxins

Some single cell marine algae common in coastal waters, such as dinoflagellates and diatoms, produce toxic compounds that can accumulate (termed bioaccumulation) in the flesh and organs of fish and invertebrates (Geraci et al. 1999; Harwood 2002). Marine mammals become exposed to these compounds when they eat prey contaminated by these naturally produced toxins although exposure can also occur through inhalation and skin contact (Van Dolah 2005). Figure F-1 shows U.S. animal mortalities from 1997-2006 resulting from toxins produced during harmful algal blooms.

In the Gulf of Mexico and mid- to southern Atlantic states, “red tides,” a form of harmful algal bloom, are created by a dinoflagellate (*Karenia brevis*). *K. brevis* is found throughout the Gulf of Mexico and sometimes along the Atlantic coast (Van Dolah 2005; NMFS 2007). It produces a neurotoxin known as brevetoxin. Brevetoxin has been associated with several marine mammal UMEs within this area (Geraci 1989; Van Dolah et al. 2003; NMFS 2004; Flewelling et al. 2005; Van Dolah 2005; NMFS 2007). On the U.S. West Coast and in the northeast Atlantic, several species of diatoms produce a toxin called domoic acid which has also been linked to marine mammal strandings (Geraci et al. 1999; Van Dolah et al. 2003; Greig et al. 2005; Van Dolah 2005; Brodie et al. 2006; NMFS 2007; Bargu et al. 2008; Goldstein et al. 2008). Other algal toxins associated with marine mammal strandings include saxitoxins and ciguatoxins and are summarized by Van Dolah (2005).



Source: Woods Hole Oceanographic Institute (WHO) http://www.whoi.edu/redtide/HABdistribution/HABmap.html

Figure F-1. Animal Mortalities from Harmful Algal Blooms within the U.S., 1997-2006.

Weather events and climate influences

Severe storms, hurricanes, typhoons, and prolonged temperature extremes may lead to localized marine mammal strandings (Geraci et al., 1999; Walsh et al. 2001). Hurricanes may have been responsible for mass strandings of pygmy killer whales in the British Virgin Islands and Gervais' beaked whales in North Carolina (Mignucci-Giannoni et al. 2000; Norman and Mead 2001). Storms in 1982-1983 along the California coast led to deaths of 2,000 northern elephant seal pups (Le Boeuf and Reiter 1991). Ice movement along southern Newfoundland has forced groups of blue whales and white-beaked dolphins ashore (Sergeant 1982). Seasonal oceanographic conditions in terms of weather, frontal systems, and local currents may also play a role in stranding (Walker et al. 2005).

The effect of large scale climatic changes to the world's oceans and how these changes impact marine mammals and influence strandings is difficult to quantify given the broad spatial and temporal scales involved, and the cryptic movement patterns of marine mammals (Moore 2005; Learmonth et al. 2006). The most immediate, although indirect, effect is decreased prey availability during unusual conditions. This, in turn, results in increased search effort required by marine mammals (Crocker et al. 2006), potential starvation if not successful, and corresponding stranding due directly to starvation or succumbing to disease or predation while in a more weakened, stressed state (Selzer and Payne 1988; Geraci et al. 1999; Moore 2005; Learmonth et al. 2006; Weise et al. 2006).

Two recent papers examined potential influences of climate fluctuation on stranding events in southern Australia, including Tasmania, an area with a history of more than 20 mass stranding since the 1920s (Evans et al., 2005; Bradshaw et al. 2006). These authors note that patterns in animal migration, survival, fecundity, population size, and strandings will revolve around the availability and distribution of food

resources. In southern Australia, movement of nutrient-rich waters pushed closer to shore by periodic meridinal winds (occurring about every 12 to 14 years) may be responsible for bringing marine mammals closer to land, thus increasing the probability of stranding (Bradshaw et al. 2006). The papers conclude, however, that while an overarching model can be helpful for providing insight into the prediction of strandings, the particular reasons for each one are likely to be quite varied.

Navigation Error

Geomagnetism - It has been hypothesized that, like some land animals, marine mammals may be able to orient to the Earth's magnetic field as a navigational cue, and that areas of local magnetic anomalies may influence strandings (Bauer et al. 1985; Klinowska 1985; Kirschvink et al. 1986; Klinowska, 1986; Walker et al. 1992; Wartzok and Ketten 1999). In a plot of live stranding positions in Great Britain with magnetic field maps, Klinowska (1985; 1986) observed an association between live stranding positions and magnetic field levels. In all cases, live strandings occurred at locations where magnetic minima, or lows in the magnetic fields, intersect the coastline. Kirschvink et al. (1986) plotted stranding locations on a map of magnetic data for the East Coast of the U.S., and were able to develop associations between stranding sites and locations where magnetic minima intersected the coast. The authors concluded that there were highly significant tendencies for cetaceans to beach themselves near these magnetic minima and coastal intersections. The results supported the hypothesis that cetaceans may have a magnetic sensory system similar to other migratory animals, and that marine magnetic topography and patterns may influence long-distance movements (Kirschvink et al. 1986). Walker et al. (1992) examined fin whale swim patterns off the northeastern U.S. continental shelf, and reported that migrating animals aligned with lows in the geometric gradient or intensity. While a similar pattern between magnetic features and marine mammal strandings at New Zealand stranding sites was not seen (Brabyn and Frew, 1994), mass strandings in Hawaii typically were found to occur within a narrow range of magnetic anomalies (Mazzuca et al. 1999).

Echolocation Disruption in Shallow Water - Some researchers believe stranding may result from reductions in the effectiveness of echolocation within shallow water, especially with the pelagic species of odontocetes that may be less familiar with coastline (Dudok van Heel 1966; Chambers and James 2005). For an odontocete, echoes from echolocation signals contain important information on the location and identity of underwater objects and the shoreline. The authors postulate that the gradual slope of a beach may present difficulties to the navigational systems of some cetaceans, since it is common for live strandings to occur along beaches with shallow, sandy gradients (Brabyn and McLean, 1992; Mazzuca et al., 1999; Maldini et al., 2005; Walker et al., 2005). A contributing factor to echolocation interference in turbulent, shallow water is the presence of microbubbles from the interaction of wind, breaking waves, and currents. Additionally, ocean water near the shoreline can have an increased turbidity (e.g., floating sand or silt, particulate plant matter, etc.) due to the run-off of fresh water into the ocean, either from rainfall or from freshwater outflows (e.g., rivers and creeks). Collectively, these factors can reduce and scatter the sound energy within echolocation signals and reduce the perceptibility of returning echoes of interest.

Social Cohesion

Many pelagic species such as sperm whale, pilot whales, melon-head whales, and false killer whales, and some dolphins occur in large groups with strong social bonds between individuals. When one or more animals strand due to any number of causative events, then the entire pod may follow suit out of social cohesion (Geraci et al. 1999; Conner 2000; Perrin and Geraci 2002; NMFS 2007).

F.1.4.2 Anthropogenic Stranding Causes and Potential Risks

With the exception of historic whaling in the 19th and early part of the 20th century, over the past few decades there has been an increase in marine mammal mortalities associated with a variety of human activities (Geraci et al. 1999; NMFS 2007). These include fisheries interactions (bycatch and directed catch), pollution (marine debris, toxic compounds), habitat modification (degradation, prey reduction), direct trauma (vessel strikes, gunshots), and noise. Figure F-2 shows potential worldwide risk to small toothed cetaceans by source.

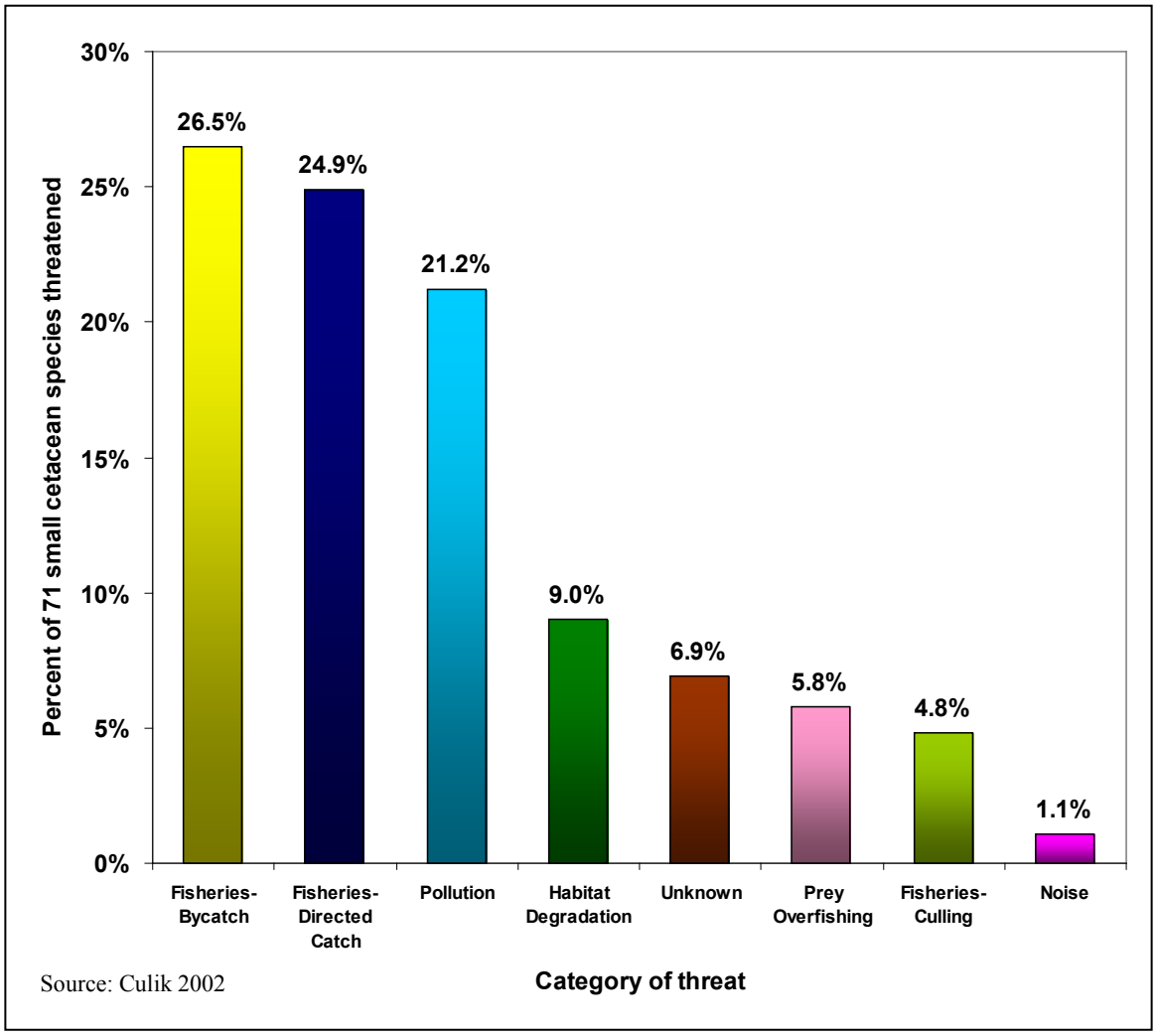


Figure F-2. Human Threats to World Wide Small Cetacean Populations

Fisheries Interaction: By-Catch, Directed Catch, and Entanglement

The incidental catch of marine mammals in commercial fisheries is a significant threat to the survival and recovery of many populations of marine mammals (Geraci et al.,1999; Baird 2002; Culik 2002; Carretta et al. 2004; Geraci and Lounsbury 2005; NMFS 2007). Interactions with fisheries and entanglement in discarded or lost gear continue to be a major factor in marine mammal deaths worldwide (Geraci et al. 1999; Nieri et al. 1999; Geraci and Lounsbury 2005; Read et al. 2006; Zeeber et al. 2006). For instance, baleen whales and pinnipeds have been found entangled in nets, ropes, monofilament line, and other fishing gear that has been discarded out at sea (Geraci et al. 1999; Campagna et al. 2007).

Bycatch - Bycatch is the catching of non-target species within a given fishing operation and can include non-commercially used invertebrates, fish, sea turtles, birds, and marine mammals (NRC 2006). Read et al. (2006) attempted to estimate the magnitude of marine mammal bycatch in U.S. and global fisheries. Data on marine mammal bycatch within the United States was obtained from fisheries observer programs, reports of entangled stranded animals, and fishery logbooks, and was then extrapolated to estimate global bycatch by using the ratio of U.S. fishing vessels to the total number of vessels within the world's fleet (Read et al., 2006). Within U.S. fisheries, between 1990 and 1999 the mean annual bycatch of marine mammals was 6,215 animals, with a standard error of +/- 448 (Read et al., 2006). Eight-four percent of cetacean bycatch occurred in gill-net fisheries, with dolphins and porpoises constituting most of the cetacean bycatch (Read et al., 2006). Over the decade there was a 40 percent decline in marine mammal bycatch, which was significantly lower from 1995-1999 than it was from 1990-1994 (Read et al., 2006). Read et al., (2006) suggests that this is primarily due to effective conservation measures that were implemented during this period.

Read et al. (2006) then extrapolated this data for the same time period and calculated an annual estimate of 653,365 of marine mammals globally, with most of the world's bycatch occurring in gill-net fisheries. With global marine mammal bycatch likely to be in the hundreds of thousands every year, bycatch in fisheries is the single greatest threat to many marine mammal populations around the world (Read et al., 2006).

Entanglement - Entanglement in active fishing gear is a major cause of death or severe injury among the endangered whales in the action area. Entangled marine mammals may die as a result of drowning, escape with pieces of gear still attached to their bodies, manage to be set free either of their own accord, or are set free by fishermen. Many large whales carry off gear after becoming entangled (Read et al., 2006). Many times when a marine mammal swims off with gear attached, the end result can be fatal. The gear may be become too cumbersome for the animal or it can be wrapped around a crucial body part and tighten over time. Stranded marine mammals frequently exhibit signs of previous fishery interaction, such as scarring or gear attached to their bodies, and the cause of death for many stranded marine mammals is often attributed to such interactions (Baird and Gorgone, 2005). Because marine mammals that die or are injured in fisheries may not wash ashore and because not all animals that do wash ashore exhibit clear signs of interactions, stranding data probably underestimate fishery-related mortality and serious injury (NMFS 2005a)

From 1993 through 2003, 1,105 harbor porpoises were reported stranded from Maine to North Carolina, many of which had cuts and body damage suggestive of net entanglement (NMFS 2005e). In 1999 it was possible to determine that the cause of death for 38 of the stranded porpoises was from fishery interactions, with one additional animal having been mutilated (right flipper and fluke cut off) (NMFS 2005e). In 2000, one stranded porpoise was found with monofilament line wrapped around its body (NMFS 2005e). In 2003, nine stranded harbor porpoises were attributed to fishery interactions, with an additional three mutilated animals (NMFS 2005e). An estimated 78 baleen whales were killed annually in the offshore Southern California/Oregon drift gillnet fishery during the 1980s (Heyning and Lewis 1990). From 1998-2005, based on observer records, five fin whales (CA/OR/WA stock), 12 humpback whales (ENP stock), and six sperm whales (CA/OR/WA stock) were either seriously injured or killed in fisheries off the mainland West Coast of the U.S. (California Marine Mammal Stranding Network Database 2006).

Ship Strike

Vessel strikes to marine mammals are another cause of mortality and stranding (Laist et al., 2001; Geraci and Lounsbury 2005; de Stephanis and Urquiola, 2006). An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could be cut by a vessel's propeller. The severity of injuries typically depends on the size and speed of the vessel (Knowlton and Kraus, 2001; Laist et al., 2001; Vanderlaan and Taggart, 2007).

An examination of all known ship strikes from all shipping sources (civilian and military) indicates vessel speed is a principal factor in whether a vessel strike results in death (Knowlton and Kraus, 2001; Laist et al., 2001, Jensen and Silber, 2003; Vanderlaan and Taggart, 2007). In assessing records in which vessel speed was known, Laist et al. (2001) found a direct relationship between the occurrence of a whale strike and the speed of the vessel involved in the collision. The authors concluded that most deaths occurred when a vessel was traveling in excess of 13 knots although most vessels do travel greater than 15 knots. Jensen and Silber (2003) detailed 292 records of known or probable ship strikes of all large whale species from 1975 to 2002. Of these, vessel speed at the time of collision was reported for 58 cases. Of these cases, 39 (or 67 percent) resulted in serious injury or death (19 or 33 percent resulted in serious injury as determined by blood in the water, propeller gashes or severed tailstock, and fractured skull, jaw, vertebrae, hemorrhaging, massive bruising or other injuries noted during necropsy and 20 or 35% resulted in death). Operating speeds of vessels that struck various species of large whales ranged from 2 to 51 knots. The majority (79 percent) of these strikes occurred at speeds of 13 knots or greater. The average speed that resulted in serious injury or death was 18.6 knots. Pace and Silber (2005) found that the probability of death or serious injury increased rapidly with increasing vessel speed. Specifically, the predicted probability of serious injury or death increased from 45 percent to 75 % as vessel speed increased from 10 to 14 knots, and exceeded 90% at 17 knots. Higher speeds during collisions result in greater force of impact, but higher speeds also appear to increase the chance of severe injuries or death by pulling whales toward the vessel. Computer simulation modeling showed that hydrodynamic forces pulling whales toward the vessel hull increase with increasing speed (Clyne, 1999; Knowlton et al., 1995).

The growth in civilian commercial ports and associated commercial vessel traffic is a result in the globalization of trade. The Final Report of the NOAA International Symposium on "Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology" stated that the worldwide commercial fleet has grown from approximately 30,000 vessels in 1950 to more than 85,000 vessels in 1998 (NRC, 2003; Southall, 2005). Between 1950 and 1998, the U.S. flagged fleet declined from approximately 25,000 to fewer than 15,000 and currently represents only a small portion of the world fleet. From 1985 to 1999, world seaborne trade doubled to 5 billion tons and currently includes 90 percent of the total world trade, with container shipping movements representing the largest volume of seaborne trade. It is unknown how international shipping volumes and densities will continue to grow. However, current statistics support the prediction that the international shipping fleet will continue to grow at the current rate or at greater rates in the future. Shipping densities in specific areas and trends in routing and vessel design are as, or more, significant than the total number of vessels. Densities along existing coastal routes are expected to increase both domestically and internationally. New routes are also expected to develop as new ports are opened and existing ports are expanded. Vessel propulsion systems are also advancing toward faster ships operating in higher sea states for lower operating costs; and container ships are expected to become larger along certain routes (Southall 2005).

While there are reports and statistics of whales struck by vessels in U.S. waters, the magnitude of the risks of commercial ship traffic poses to marine mammal populations is difficult to quantify or estimate. In addition, there is limited information on vessel strike interactions between ships and marine mammals outside of U.S. waters (de Stephanis and Urquiola 2006). Laist et al. (2001) concluded that ship collisions may have a negligible effect on most marine mammal populations in general, except for regional based small populations where the significance of low numbers of collisions would be greater given smaller populations or populations segments.

U.S. Navy vessel traffic is a small fraction of the overall U.S. commercial and fishing vessel traffic. While U.S. Navy vessel movements may contribute to the ship strike threat, given the lookout and mitigation measures adopted by the U.S. Navy, probability of vessel strikes is greatly reduced. Furthermore, actions to avoid close interaction of U.S. Navy ships and marine mammals and sea turtles, such as maneuvering to keep away from any observed marine mammal and sea turtle are part of existing

at-sea protocols and standard operating procedures. Navy ships have up to three or more dedicated and trained lookouts as well as two to three bridge watchstanders during at-sea movements who would be searching for any whales, sea turtles, or other obstacles on the water surface. Such lookouts are expected to further reduce the chances of a collision.

Commercial and Private Marine Mammal Viewing

In addition to vessel operations, private and commercial vessels engaged in marine mammal watching also have the potential to impact marine mammals in Southern California. NMFS has promulgated regulations at 50 CFR 224.103, which provide specific prohibitions regarding wildlife viewing activities. In addition, NMFS launched an education and outreach campaign to provide commercial operators and the general public with responsible marine mammal viewing guidelines. In January 2002, NMFS also published an official policy on human interactions with wild marine mammals which states: "NOAA Fisheries cannot support, condone, approve or authorize activities that involve closely approaching, interacting or attempting to interact with whales, dolphins, porpoises, seals, or sea lions in the wild. This includes attempting to swim, pet, touch or elicit a reaction from the animals."

Although considered by many to be a non-consumptive use of marine mammals with economic, recreational, educational, and scientific benefits, marine mammal watching is not without potential negative impacts. One concern is that animals become more vulnerable to vessel strikes once they habituate to vessel traffic (Swingle et al. 1993; Wiley et al. 1995). Another concern is that preferred habitats may be abandoned if disturbance levels are too high. A whale's behavioral response to whale watching vessels depends on the distance of the vessel from the whale, vessel speed, vessel direction, vessel noise, and the number of vessels (Amaral and Carlson 2005; Au and Green 2000; Cockeron 1995; Erbe 2002; Felix 2001; Magalhaes et al. 2002; Richter et al. 2003; Schedat et al. 2004; Simmonds 2005; Watkins 1986; Williams et al. 2002). The whale's responses changed with these different variables and, in some circumstances, the whales did not respond to the vessels, but in other circumstances, whales changed their vocalizations surface time, swimming speed, swimming angle or direction, respiration rates, dive times, feeding behavior, and social interactions. In addition to the information on whale watching, there is also direct evidence of pinniped haul out site (Pacific harbor seals) abandonment because of human disturbance at Strawberry Spit in San Francisco Bay (Allen 1991).

Ingestion of Plastic Objects and Other Marine Debris and Toxic Pollution Exposure

For many marine mammals, debris in the marine environment is a great hazard and can be harmful to wildlife. Not only is debris a hazard because of possible entanglement, animals may mistake plastics and other debris for food (NMFS, 2007g). U.S. Navy vessels have a zero-plastic discharge policy and return all plastic waste to appropriate disposition on shore.

There are certain species of cetaceans, along with Florida manatees, that are more likely to eat trash, especially plastics, which is usually fatal for the animal (Geraci et al. 1999). From 1990 through October 1998, 215 pygmy sperm whales stranded along the U.S. Atlantic Coast from New York through the Florida Keys (NMFS 2005a). Remains of plastic bags and other debris were found in the stomachs of 13 of these animals (NMFS 2005a). During the same period, 46 dwarf sperm whale strandings occurred along the U.S. Atlantic coastline between Massachusetts and the Florida Keys (NMFS 2005d). In 1987 a pair of latex examination gloves was retrieved from the stomach of a stranded dwarf sperm whale (NMFS 2005d). One hundred twenty-five pygmy sperm whales were reported stranded from 1999 to 2003 between Maine and Puerto Rico; in one pygmy sperm whale found stranded in 2002, red plastic debris was found in the stomach along with squid beaks (NMFS 2005a).

Sperm whales have been known to ingest plastic debris, such as plastic bags (Evans et al. 2003; Whitehead 2003). While this has led to mortality, the scale to which this is affecting sperm whale populations is unknown, but Whitehead (2003) suspects it is not substantial at this time.

High concentrations of potentially toxic substances within marine mammals along with an increase in new diseases have been documented in recent years. Scientists have begun to consider the possibility of a link between pollutants and marine mammal mortality events. NMFS takes part in a marine mammal bio-monitoring program not only to help assess the health and contaminant loads of marine mammals, but also to assist in determining anthropogenic impacts on marine mammals, marine food chains and marine ecosystem health. Using strandings and bycatch animals, the program provides tissue/serum archiving, samples for analyses, disease monitoring and reporting, and additional response during disease investigations (NMFS 2007).

The impacts of these activities are difficult to measure. However, some researchers have correlated contaminant exposure to possible adverse health effects in marine mammals. Contaminants such as organochlorines do not tend to accumulate in significant amounts in invertebrates, but do accumulate in fish and fish-eating animals. Thus, contaminant levels in planktivorous mysticetes have been reported to be one to two orders of magnitude lower compared to piscivorous odontocetes (Borell 1993; O'Shea and Brownell 1994; O'Hara and Rice 1996; O'Hara et al. 1999).

The manmade chemical PCB (polychlorinated biphenyl), and the pesticide DDT (dichlorodiphyenyltrichloroethane), are both considered persistent organic pollutants that are currently banned in the United States for their harmful effects in wildlife and humans (NMFS, 2007c). Despite having been banned for decades, the levels of these compounds are still high in marine mammal tissue samples taken along U.S. coasts (NMFS, 2007c). Both compounds are long-lasting, reside in marine mammal fat tissues (especially in the blubber), and can be toxic causing effects such as reproductive impairment and immunosuppression (NMFS, 2007c).

Both long-finned and short-finned pilot whales have a tendency to mass strand throughout their range. Short-finned pilot whales have been reported as stranded as far north as Rhode Island, and long-finned pilot whales as far south as South Carolina (NMFS 2005b). For U.S. East Coast stranding records, both species are lumped together and there is rarely a distinction between the two because of uncertainty in species identification (NMFS 2005b). Since 1980 within the Northeast region alone, between 2 and 120 pilot whales have stranded annually either individually or in groups (NMFS 2005b). Between 1999 and 2003 from Maine to Florida, 126 pilot whales were reported stranded, including a mass stranding of 11 animals in 2000 and another mass stranding of 57 animals in 2002, both along the Massachusetts coast (NMFS 2005b).

It is unclear how much of a role human activities play in these pilot whale strandings, and toxic poisoning may be a potential human-caused source of mortality for pilot whales (NMFS, 2005b). Moderate levels of PCBs and chlorinated pesticides (such as DDT, DDE, and dieldrin) have been found in pilot whale blubber (NMFS 2005b). Bioaccumulation levels have been found to be more similar in whales from the same stranding event than from animals of the same age or sex (NMFS 2005b). Numerous studies have measured high levels of toxic metals (mercury, lead, and cadmium), selenium, and PCBs in pilot whales in the Faroe Islands (NMFS 2005b). Population effects resulting from such high contamination levels are currently unknown (NMFS 2005b).

Habitat contamination and degradation may also play a role in marine mammal mortality and strandings. Some events caused by man have direct and obvious effects on marine mammals, such as oil spills (Geraci et al. 1999). But in most cases, effects of contamination will more than likely be indirect in nature, such as effects on prey species availability, or by increasing disease susceptibility (Geraci et al. 1999).

U.S. Navy vessel operation between ports and exercise locations has the potential for release of small amounts of pollutant discharges into the water column. U.S. Navy vessels are not a typical source, however, of either pathogens or other contaminants with bioaccumulation potential such as pesticides and

PCBs. Furthermore, any vessel discharges such as bilge water and deck runoff associated with the vessels would be in accordance with international and U.S. requirements for eliminating or minimizing discharges of oil, garbage, and other substances, and not likely to contribute significant changes to ocean water quality.

Deep Water Ambient Noise

Urick (1983) provided a discussion of the ambient noise spectrum expected in the deep ocean. Shipping, seismic activity, and weather, are the primary causes of deep-water ambient noise. The ambient noise frequency spectrum can be predicted fairly accurately for most deep-water areas based primarily on known shipping traffic density and wind state (wind speed, Beaufort wind force, or sea state) (Urick 1983). For example, for frequencies between 100 and 500 Hz, Urick (1983) estimated the average deep water ambient noise spectra to be 73 to 80 dB for areas of heavy shipping traffic and high sea states, and 46 to 58 dB for light shipping and calm seas.

Shallow Water Ambient Noise

In contrast to deep water, ambient noise levels in shallow waters (i.e., coastal areas, bays, harbors, etc.) are subject to wide variations in level and frequency depending on time and location. The primary sources of noise include distant shipping and industrial activities, wind and waves, marine animals (Urick 1983). At any give time and place, the ambient noise is a mixture of all of these noise variables. In addition, sound propagation is also affected by the variable shallow water conditions, including the depth, bottom slope, and type of bottom. Where the bottom is reflective, the sounds levels tend to be higher, than when the bottom is absorptive.

Noise from Aircraft and Vessel Movement

Surface shipping is the most widespread source of anthropogenic, low frequency (0 to 1,000 Hz) noise in the oceans and may contribute to over 75 percent of all human sound in the sea (Simmonds and Hutchinson 1996, ICES 2005b). Ross (1976) has estimated that between 1950 and 1975, shipping had caused a rise in ambient noise levels of 10 dB. He predicted that this would increase by another 5 dB by the beginning of the 21st century. The National Resource Council (1997) estimated that the background ocean noise level at 100 Hz has been increasing by about 1.5 dB per decade since the advent of propeller-driven ships. Michel et al. (2001) suggested an association between long-term exposure to low frequency sounds from shipping and an increased incidence of marine mammal mortalities caused by collisions with ships.

Sound from a low-flying helicopter or airplane may be heard by marine mammals and turtles while at the surface or underwater. Due to the transient nature of sounds from aircraft involved in at-sea operations, such sounds would not likely cause physical effects but have the potential to affect behaviors. Responses by mammals and turtles could include hasty dives or turns, or decreased foraging (Soto et al., 2006). Whales may also slap the water with flukes or flippers or swim away from the aircraft track.

Sound emitted from large vessels, particularly in the course of transit, is the principal source of noise in the ocean today, primarily due to the properties of sound emitted by civilian cargo vessels (Richardson et al., 1995; Arveson and Vendittis, 2000). Ship propulsion and electricity generation engines, engine gearing, compressors, bilge and ballast pumps, as well as hydrodynamic flow surrounding a ship's hull and any hull protrusions contribute to a large vessels' noise emission into the marine environment. Propeller-driven vessels also generate noise through cavitation, which accounts for much of the noise emitted by a large vessel depending on its travel speed. Military vessels underway or involved in naval operations or exercises, also introduce anthropogenic noise into the marine environment. Noise emitted by large vessels can be characterized as low-frequency, continuous, and tonal. The sound pressure levels at the vessel will vary according to speed, burden, capacity and length (Richardson et al. 1995; Arveson and Vendittis, 2000). Vessels ranging from 135 to 337 meters generate peak source sound levels from 169

to 200 dB between 8 Hz and 430 Hz, although Arveson and Vendittis (2000) documented components of higher frequencies (10-30 kHz) as a function of newer merchant ship engines and faster transit speeds.

Whales have variable responses to vessel presence or approaches, ranging from apparent tolerance to diving away. Unfortunately, it is not always possible to determine whether the whales are responding to the vessel itself or the noise generated by the engine and cavitation around the propeller. Apart from some disruption of behavior, an animal may be unable to hear other sounds in the environment due to masking by the noise from the vessel. Any masking of environmental sounds or conspecific sounds is expected to be temporary, as noise dissipates with a vessel transit through an area.

Vessel noise primarily raises concerns for masking of environmental and conspecific cues. However, exposure to vessel noise of sufficient intensity and/or duration can also result in temporary or permanent loss of sensitivity at a given frequency range, referred to as temporary or permanent threshold shifts (TTS or PTS). Threshold shifts are assumed to be possible in marine mammal species as a result of prolonged exposure to large vessel traffic noise due to its intensity, broad geographic range of effectiveness, and constancy.

Collectively, significant cumulative exposure to individuals, groups, or populations can occur if they exhibit site fidelity to a particular area; for example, whales that seasonally travel to a regular area to forage or breed may be more vulnerable to noise from large vessels compared to transiting whales. Any permanent threshold shift in a marine animal's hearing capability, especially at particular frequencies for which it can normally hear best, can impair its ability to perceive threats, including ships. Whales have variable responses to vessel presence or approaches, ranging from apparent tolerance to diving away from a vessel. It is not possible to determine whether the whales are responding to the vessel itself or the noise generated by the engine and cavitation around the propeller. Apart from some disruption of behavior, an animal may be unable to hear other sounds in the environment due to masking by the noise from the vessel.

Most observations of behavioral responses of marine mammals to human generated sounds have been limited to short-term behavioral responses, which included the cessation of feeding, resting, or social interactions. Nowacek et al. (2007) provide a detailed summary of cetacean response to underwater noise.

Given the sound propagation of low frequency sounds, a large vessel in this sound range can be heard 139 to 463 kilometers away (Ross, 1976 in Polefka, 2004). U.S. Navy vessels, however, have incorporated significant underwater ship quieting technology to reduce their acoustic signature (compared to a similarly sized vessel) in order to reduce their vulnerability to detection by enemy passive acoustics (Southall, 2005). Therefore, the potential for TTS or PTS from U.S. Navy vessel and aircraft movement is extremely low given that the exercises and training events are transitory in time, with vessels moving over large area of the ocean. A marine mammal or sea turtle is unlikely to be exposed long enough at high levels for TTS or PTS to occur. Any masking of environmental sounds or conspecific sounds is expected to be temporary, as noise dissipates with a U.S. Navy vessel transiting through an area. If behavioral disruptions result from the presence of aircraft or vessels, it is expected to be temporary. Animals are expected to resume their migration, feeding, or other behaviors without any threat to their survival or reproduction. However, if an animal is aware of a vessel and dives or swims away, it may successfully avoid being struck.

F.1.5 Stranding Events Associated with Navy Sonar

There are two classes of sonars employed by the U.S. Navy: active sonars and passive sonars. Most active military sonars operate in a limited number of areas, and are most likely not a significant contributor to a comprehensive global ocean noise budget (ICES, 2005b).

The effects of mid-frequency active naval sonar on marine wildlife have not been studied as extensively as the effects of air-guns used in seismic surveys (Madsen et al., 2006; Stone and Tasker, 2006; Wilson et al., 2006; Palka and Johnson, 2007; Parente et al., 2007). Maybaum (1989, 1993) observed changes in behavior of humpbacks during playback tapes of the M-1002 system (using 203 dB re 1 µPa-m for study); specifically, a decrease in respiration, submergence, and aerial behavior rates; and an increase in speed of travel and track linearity. Direct comparison of Maybaum's results, however, with U.S Navy mid-frequency active sonar are difficult to make. Maybaum's signal source, the commercial M-1002, operated differently from naval mid-frequency sonar. In addition, behavioral responses were observed during playbacks of a control tape, (i.e. a tape with no sound signal) so interpretation of Maybaum's results are inconclusive.

Research by Nowacek, et al. (2004) on North Atlantic right whales using a whale alerting signal designed to alert whales to human presence suggests that received sound levels of only 133 to 148 pressure level (decibel [dB] re 1 microPascals [µPa]) for the duration of the sound exposure may disrupt feeding behavior. The authors did note, however, that within minutes of cessation of the source, a return to normal behavior would be expected. Direct comparison of the Nowacek et al. (2004) sound source to MFA sonar, however, is not possible given the radically different nature of the two sources. Nowacek et al.'s source was a series of non-sonar like sounds designed to purposely alert the whale, lasting several minutes, and covering a broad frequency band. Direct differences between Nowacek et al. (2004) and MFA sonar is summarized below from Nowacek et al. (2004) and Nowacek et al. (2007):

(1) Signal duration: Time difference between the two signals is significant, 18-minute signal used by Nowacek et al. versus < 1 sec for MFA sonar.

(2) Frequency modulation: Nowacek et al. contained three distinct signals containing frequency modulated sounds:

1st - alternating 1-sec pure tone at 500 and 850 Hz

2nd - 2-sec logarithmic down-sweep from 4500 to 500 Hz

3rd - pair of low-high (1500 and 2000 Hz) sine wave tones amplitude modulated at 120 Hz

(3) Signal-to-noise ratio: Nowacek et al.'s signal maximized signal-to noise-ratio so that it would be distinct from ambient noise and resist masking.

(4) Signal acoustic characteristics: Nowacek et al.'s signal comprised of disharmonic signals spanning northern right whales' estimated hearing range.

Given these differences, therefore, the exact cause of apparent right whale behavior noted by the authors can not be attributed to any one component since the source was such a mix of signal types.

The effects of naval sonars on marine wildlife have not been studied as extensively as have the effects of airguns used in seismic surveys (Nowacek et al., 2007). In the Caribbean, sperm whales were observed to interrupt their activities by stopping echolocation and leaving the area in the presence of underwater sounds surmised to have originated from submarine sonar signals (Watkins and Schevill, 1975; Watkins et al., 1985). The authors did not report receive levels from these exposures, and also got a similar reaction from artificial noise they generated by banging on their boat hull. It was unclear if the sperm whales were reacting to the sonar signal itself or to a potentially new unknown sound in general. Madsen et al. (2006) tagged and monitored eight sperm whales in the Gulf of Mexico exposed to seismic airgun surveys. Sound sources were from approximately 2 to 7 nm (4 to 13 km) away from the whales and based on multipath propagation RLs were as high as 162 dB re 1 uPa with energy content greatest between 0.3

and 3.0 kHz. Sperm whales engaged in foraging dives continued the foraging dives throughout exposures to these seismic pulses. In the Caribbean Sea, sperm whales avoided exposure to mid-frequency submarine sonar pulses, in the range 1000 Hz to 10,000 Hz (IWC 2005). Sperm whales have also moved out of areas after the start of air gun seismic testing (Davis et al. 1995). In contrast, during playback experiments off the Canary Islands, André et al. (1997) reported that foraging sperm whales exposed to a 10 kHz pulsed signal did not exhibit any general avoidance reactions.

The Navy sponsored tests of the effects of low-frequency active (LFA) sonar source, between 100 Hz and 1000 Hz, on blue, fin, and humpback whales. The tests demonstrated that whales exposed to sound levels up to 155 dB did not exhibit significant disturbance reactions, though there was evidence that humpback whales altered their vocalization patterns in reaction to the noise. Given that the source level of the Navy's LFA is reported to be in excess of 215 dB, the possibility exists that animals in the wild may be exposed to sound levels much higher than 155 dB.

Acoustic exposures have been demonstrated to kill marine mammals and result in physical trauma, and injury (Ketten 2005). Animals in or near an intense noise source can die from profound injuries related to shock wave or blast effects. Acoustic exposures can also result in noise induced hearing loss that is a function of the interactions of three factors: sensitivity, intensity, and frequency. Loss of sensitivity is referred to as a threshold shift; the extent and duration of a threshold shift depends on a combination of several acoustic features and is specific to particular species (TTS or PTS, depending on how the frequency, intensity and duration of the exposure combine to produce damage). In addition to direct physiological effects, noise exposures can impair an animal's sensory abilities (masking) or result in behavioral responses such as aversion or attraction (see Section 3.19).

Acoustic exposures can also result in the death of an animal by impairing its foraging, ability to detect predators or communicate, or by increasing stress, and disrupting important physiological events. Whales have moved away from their feeding and mating grounds (Bryant *et al*., 1984; Morton and Symnods, 2002; Weller et al., 2002), moved away from their migration route (Richardson et al., 1995), and have changed their calls due to noise (Miller et al., 2000). Acoustic exposures such as MFA sonar tend to be infrequent and temporary in nature. In situations such as the alteration of gray whale migration routes in response to shipping and whale watching boats, those acoustic exposures were chronic over several years (Moore and Clarke 2002). This was also true of the effect of seismic survey airguns (daily for 39 days) on the use of feeding areas by gray whales in the western North Pacific although whales began returning to the feeding area within one day of the end of the exposure (Weller et al. 2002).

Below are evaluations of the general information available on the variety of ways in which cetaceans and pinnipeds have been reported to respond to sound, generally, and mid-frequency sonar, in particular.

The Navy is very concerned and coordinates with NMFS as they thoroughly investigate each marine mammal stranding potentially associated with Navy activities to better understand the events surrounding strandings (Norman 2006). Strandings can involve a single animal or several to hundreds. An event where animals are found out of their normal habitat may be considered a stranding even though animals do not necessarily end up beaching (such as the July 2004 "Hanalei Mass Stranding Event"; Southall et al., 2006). Several hypotheses have been given for the mass strandings which include the impact of shallow beach slopes on odontocete sonar, disease or parasites, geomagnetic anomalies that affect navigation, following a food source in close to shore, avoiding predators, social interactions that cause other cetaceans to come to the aid of stranded animals, and human actions. Generally, inshore species do not strand in large numbers but generally just as a single animal. This may be due to their familiarity with the coastal area whereas pelagic species that are unfamiliar with obstructions or sea bottom tend to strand more often in larger numbers (Woodings, 1995). The Navy has studied several stranding events in detail that may have occurred in association with Navy sonar activities. To better understand the causal factors in stranding events that may be associated with Navy sonar activities, the main factors, including

bathymetry (i.e., steep drop offs), narrow channels (less than 35 nm), environmental conditions (e.g., surface ducting), and multiple sonar ships were compared between the different stranding events.

When a marine mammal swims or floats onto shore and becomes "beached" or stuck in shallow water, it is considered a "stranding" (MMPA section 410 (16 USC section 1421g); NMFS, 2007a). NMFS explains that "a cetacean is considered stranded when it is on the beach, dead or alive, or in need of medical attention while free-swimming in U.S. waters. A pinniped is considered to be stranded either when dead or when in distress on the beach and not displaying normal haul-out behavior" (NMFS, 2007b).

Over the past three decades, several "mass stranding" events [strandings involving two or more individuals of the same species (excluding a single cow-calf pair) and at times, individuals from different species] that have occurred have been associated with naval operations, seismic surveys, and other anthropogenic activities that introduce sound into the marine environment (Canary Islands, Greece, Vieques, U.S. Virgin Islands, Madeira Islands, Haro Strait, Washington State, Alaska, Hawaii, North Carolina).

Information was collected on mass stranding events (events in which two or more cetaceans stranded) that have occurred and for which reports are available, from the past 40 years. Any causal agents that have been associated with those stranding events were also identified. Major range events undergo name changes over the years, however, the equivalent of COMPTUEX and JTFEX have been conducted in southern California since 1934. Training involving sonar has been conducted since World War II and sonar systems described in the SOCAL EIS/OEIS since the 1970's (Jane's 2005).

F.1.6 Stranding Analysis

Over the past two decades, several mass stranding events involving beaked whales have been documented. While beaked whale strandings have been reported since the 1800s (Geraci and Lounsbury, 1993; Cox et al., 2006; Podesta et al., 2006), several mass strandings since have been associated with naval operations that may have included mid-frequency sonar (Simmonds and Lopez-Jurado, 1991; Frantzis, 1998; Jepson et al., 2003; Cox et al., 2006). As Cox et al. (2006) concludes, the state of science can not yet determine if a sound source such as mid-frequency sonar alone causes beaked whale strandings, or if other factors (acoustic, biological, or environmental) must co-occur in conjunction with a sound source.

A review of historical data (mostly anecdotal) maintained by the Marine Mammal Program in the National Museum of Natural History, Smithsonian Institution reports 49 beaked whale mass stranding events between 1838 and 1999. The largest beaked whale mass stranding occurred in the 1870s in New Zealand when 28 Gray's beaked whales (*Mesoplodon grayi*) stranded. Blainsville's beaked whale (*Mesoplodon densirostris*) strandings are rare, and records show that they were involved in one mass stranding in 1989 in the Canary Islands. Cuvier's beaked whales (*Ziphius cavirostris*) are the most frequently reported beaked whale to strand, with at least 19 stranding events from 1804 through 2000 (DoC and DoN, 2001; Smithsonian Institution, 2000).

The discussion below centers on those worldwide stranding events that may have some association with naval operations, and global strandings that the U.S. Navy feels are either inconclusive or can not be associated with naval operations.

F.1.6.1 Naval Association

In the following sections, specific stranding events that have been putatively linked to potential sonar operations are discussed. Of note, these events represent a small number of animals over an 11-year period (40 animals), and not all worldwide beaked whale strandings can be linked to naval activity (ICES

2005a; 2005b; Podesta et al., 2006). Four of the five events occurred during NATO exercises or events where U.S. Navy presence was limited (Greece, Portugal, Spain). One of the five events involved only U.S. Navy ships (Bahamas).

Beaked whale stranding events associated with potential naval operations.

1996 May	Greece (NATO)
2000 March	Bahamas (US)
2000 May	Portugal, Madeira Islands (NATO/US)
2002 September	Spain, Canary Islands (NATO/US)
2006 January	Spain, Mediterranean Sea coast (NATO/US)

Case Studies of Stranding Events (coincidental with or implicated with naval sonar)

1996 Greece Beaked Whale Mass Stranding (May 12 – 13, 1996)

Description: Twelve Cuvier's beaked whales (*Ziphius cavirostris*) stranded along a 38.2-kilometer strand of the coast of the Kyparissiakos Gulf on May 12 and 13, 1996 (Frantzis, 1998). From May 11 through May 15, the NATO research vessel Alliance was conducting sonar tests with signals of 600 Hz and 3 kHz and root-mean-squared (rms) sound pressure levels (SPL) of 228 and 226 dB re: 1µPa, respectively (D'Amico and Verboom, 1998; D'Spain et al., 2006). The timing and the location of the testing encompassed the time and location of the whale strandings (Frantzis, 1998).

Findings: Partial necropsies of eight of the animals were performed, including external assessments and the sampling of stomach contents. No abnormalities attributable to acoustic exposure were observed, but the stomach contents indicated that the whales were feeding on cephalopods soon before the stranding event. No unusual environmental events before or during the stranding event could be identified (Frantzis, 1998).

Conclusions: The timing and spatial characteristics of this stranding event were atypical of stranding in Cuvier's beaked whale, particularly in this region of the world. No natural phenomenon that might contribute to the stranding event coincided in time with the mass stranding. Because of the rarity of mass strandings in the Greek Ionian Sea, the probability that the sonar tests and stranding coincided in time and location, while being independent of each other, was estimated as being extremely low (Frantzis, 1998). However, because information for the necropsies was incomplete and inconclusive, the cause of the stranding cannot be precisely determined.

2000 Bahamas Marine Mammal Mass Stranding (March 15-16, 2000)

Description: Seventeen marine mammals - Cuvier's beaked whales, Blainville's beaked whales (*Mesoplodon densirostris*), minke whale (*Balaenoptera acutorostrata*), and one spotted dolphin (*Stenella frontalis*), stranded along the Northeast and Northwest Providence Channels of the Bahamas Islands on March 15-16, 2000 (Evans and England, 2001). The strandings occurred over a 36-hour period and coincided with U.S. Navy use of mid-frequency active sonar within the channel. Navy ships were involved in tactical sonar exercises for approximately 16 hours on March 15. The ships, which operated the AN/SQS-53C and AN/SQS-56, moved through the channel while emitting sonar pings approximately every 24 seconds. The timing of pings was staggered between ships and average source levels of pings varied from a nominal 235 dB SPL (AN/SQS-53C) to 223 dB SPL (AN/SQS-56). The center frequency of pings was 3.3 kHz and 6.8 to 8.2 kHz, respectively.

Seven of the animals that stranded died, while ten animals were returned to the water alive. The animals known to have died included five Cuvier's beaked whales, one Blainville's beaked whale, and the single spotted dolphin. Six necropsies were performed and three of the six necropsied animals (one Cuvier's beaked whale, one Blainville's beaked whale, and the spotted dolphin) were fresh enough to permit identification of pathologies by computerized tomography (CT). Tissues from the remaining three animals were in a state of advanced decomposition at the time of inspection.

Findings: The spotted dolphin demonstrated poor body condition and evidence of a systemic debilitating disease. In addition, since the dolphin stranding site was isolated from the acoustic activities of Navy ships, it was determined that the dolphin stranding was unrelated to the presence of Navy active sonar.

All five necropsied beaked whales were in good body condition and did not show any signs of external trauma or disease. In the two best preserved whale specimens, hemorrhage was associated with the brain and hearing structures. Specifically, subarachnoid hemorrhage within the temporal region of the brain and intracochlear hemorrhages were noted. Similar findings of bloody effusions around the ears of two other moderately decomposed whales were consistent with the same observations in the freshest animals. In addition, three of the whales had small hemorrhages in their acoustic fats, which are fat bodies used in sound production and reception (i.e., fats of the lower jaw and the melon). The best-preserved whale demonstrated acute hemorrhage within the kidney, inflammation of the lung and lymph nodes, and congestion and mild hemorrhage in multiple other organs. Other findings were consistent with stresses and injuries associated with the stranding process. These consisted of external scrapes, pulmonary edema and congestion.

Conclusions: The post-mortem analyses of stranded beaked whales lead to the conclusion that the immediate cause of death resulted from overheating, cardiovascular collapse and stresses associated with being stranded on land. However, subarachnoid and intracochlear hemorrhages were believed to have occurred prior to stranding and were hypothesized as being related to an acoustic event. Passive acoustic monitoring records demonstrated that no large scale acoustic activity besides the Navy sonar exercise occurred in the times surrounding the stranding event. The mechanism by which sonar could have caused the observed traumas or caused the animals to strand was undetermined. The spotted dolphin was in overall poor condition for examination, but showed indications of long-term disease. No analysis of baleen whales (minke whale) was conducted. Baleen whale stranding events have not been associated with either low-frequency or mid-frequency sonar use (ICES 2005a, 2005b).

2000 Madeira Island, Portugal Beaked Whale Strandings (May 10 – 14, 2000)

Description: Three Cuvier's beaked whales stranded on two islands in the Madeira Archipelago, Portugal, from May 10 to 14, 2000 (Cox et al., 2006). A joint NATO amphibious training exercise, named "Linked Seas 2000," which involved participants from 17 countries, took place in Portugal during May 2 to 15, 2000. The timing and location of the exercises overlapped with that of the stranding incident.

Findings: Two of the three whales were necropsied. Two heads were taken to be examined. One head was intact and examined grossly and by CT; the other was only grossly examined because it was partially flensed and had been seared from an attempt to dispose of the whale by fire (Ketten, 2005).

No blunt trauma was observed in any of the whales. Consistent with prior CT scans of beaked whales stranded in the Bahamas 2000 incident, one whale demonstrated subarachnoid and peribullar hemorrhage and blood within one of the brain ventricles. Post-cranially, the freshest whale demonstrated renal congestion and hemorrhage, which was also consistent with findings in the freshest specimens in the Bahamas incident.

Conclusions: The pattern of injury to the brain and auditory system were similar to those observed in the Bahamas strandings, as were the kidney lesions and hemorrhage and congestion in the lungs (Ketten, 2005). The similarities in pathology and stranding patterns between these two events suggested a similar causative mechanism. Although the details about whether or how sonar was used during "Linked Seas 2000" is unknown, the presence of naval activity within the region at the time of the strandings suggested a possible relationship to Navy activity.

2002 Canary Islands Beaked Whale Mass Stranding (September 24, 2002)

Description: On September 24, 2002, 14 beaked whales stranded on Fuerteventura and Lanzaote Islands in the Canary Islands (Jepson et al., 2003). Seven of the 14 whales died on the beach and the 7 were returned to the ocean. Four beaked whales were found stranded dead over the next three days either on the coast or floating offshore (Fernández et al., 2005). At the time of the strandings, an international naval exercise (Neo-Tapon 2002) that involved numerous surface warships and several submarines was being conducted off the coast of the Canary Islands. Tactical mid-frequency active sonar was utilized during the exercises, and strandings began within hours of the onset of the use of mid-frequency sonar (Fernández et al., 2005).

Findings: Eight Cuvier's beaked whales, one Blainville's beaked whale, and on Gervais' beaked whale were necropsied; six of them within 12 hours of stranding (Fernández et al. 2005). The stomachs of the whales contained fresh and undigested prey contents. No pathogenic bacteria were isolated from the whales, although parasites were found in the kidneys of all of the animals. The head and neck lymph nodes were congested and hemorrhages were noted in multiple tissues and organs, including the kidney, brain, ears, and jaws. Widespread fat emboli were found throughout the carcasses, but no evidence of blunt trauma was observed in the whales. In addition, the parenchyma of several organs contained macroscopic intravascular bubbles and lesions, putatively associated with nitrogen off-gassing.

Conclusions: The association of NATO mid-frequency sonar use close in space and time to the beaked whale strandings, and the similarity between this stranding event and previous beaked whale mass strandings coincident with sonar use, suggests that a similar scenario and causative mechanism of stranding may be shared between the events. Beaked whales stranded in this event demonstrated brain and auditory system injuries, hemorrhages, and congestion in multiple organs, similar to the pathological findings of the Bahamas and Madeira stranding events. In addition, the necropsy results of the Canary Islands stranding event lead to the hypothesis that the presence of disseminated and widespread gas bubbles and fat emboli were indicative of nitrogen bubble formation, similar to what might be expected in decompression sickness (Jepson et al., 2003; Fernández et al., 2005). Whereas gas emboli would develop from the nitrogen gas, fat emboli would enter the blood stream from ruptured fat cells (presumably where nitrogen bubble formation occurs) or through the coalescence of lipid bodies within the blood stream.

The possibility that the gas and fat emboli found by Fernández et al. (2005) was due to nitrogen bubble formation has been hypothesized to be related to either direct activation of the bubble by sonar signals or to a behavioral response in which the beaked whales flee to the surface following sonar exposure. The first hypothesis is related to rectified diffusion (Crum and Mao, 1996), the process of increasing the size of a bubble by exposing it to a sound field. This process is facilitated if the environment in which the ensonified bubbles exist is supersaturated with gas. Repetitive diving by marine mammals can cause the blood and some tissues to accumulate gas to a greater degree than is supported by the surrounding environmental pressure (Ridgway and Howard, 1979). Deeper and longer dives of some marine mammals, such as those conducted by beaked whales, are theoretically predicted to induce greater levels of supersaturation (Houser et al., 2001). If rectified diffusion were possible in marine mammals exposed to high-level sound, conditions of tissue supersaturation could theoretically speed the rate and increase the size of bubble growth. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness. It is unlikely that the brief duration of

sonar pings would be long enough to drive bubble growth to any substantial size, if such a phenomenon occurs. However, an alternative but related hypothesis has also been suggested: stable bubbles could be destabilized by high-level sound exposures such that bubble growth then occurs through static diffusion of gas out of the tissues. In such a scenario the marine mammal would need to be in a gas-supersaturated state long enough for bubbles to become of a problematic size. The second hypothesis speculates that rapid ascent to the surface following exposure to a startling sound might produce tissue gas saturation sufficient for the evolution of nitrogen bubbles (Jepson et al. 2003; Fernández et al. 2005). In this scenario, the rate of ascent would need to be sufficiently rapid to compromise behavioral or physiological protections against nitrogen bubble formation. Tyack et al. (2006) showed that beaked whales often make rapid ascents from deep dives suggesting that it is unlikely that beaked whales would suffer from decompression sickness. Zimmer and Tyack (2007) speculated that if repetitive shallow dives that are used by beaked whales to avoid a predator or a sound source, they could accumulate high levels of nitrogen because they would be above the depth of lung collapse (above about 210 feet) and could lead to decompression sickness. There is no evidence that beaked whales dive in this manner in response to predators or sound sources and other marine mammals such as Antarctic and Galapagos fur seals, and pantropical spotted dolphins make repetitive shallow dives with no apparent decompression sickness (Kooyman and Trillmich, 1984; Kooyman et al., 1984; Baird et al., 2001).

Although theoretical predictions suggest the possibility for acoustically mediated bubble growth, there is considerable disagreement among scientists as to its likelihood (Piantadosi and Thalmann, 2004). Sound exposure levels predicted to cause in vivo bubble formation within diving cetaceans have not been evaluated and are suspected as needing to be very high (Evans, 2002; Crum et al., 2005). Moore and Early (2004) reported that in analysis of sperm whale bones spanning 111 years, gas embolism symptoms were observed indicating that sperm whales may be susceptible to decompression sickness due to natural diving behavior. Further, although it has been argued that traumas from recent beaked whale strandings are consistent with gas emboli and bubble-induced tissue separations (Jepson et al. 2003), there is no conclusive evidence supporting this hypothesis and there is concern that at least some of the pathological findings (e.g., bubble emboli) are artifacts of the necropsy. Currently, stranding networks in the United States have agreed to adopt a set of necropsy guidelines to determine, in part, the possibility and frequency with which bubble emboli can be introduced into marine mammals during necropsy procedures (Arruda et al., 2007).

2006 Spain, Gulf of Vera Beaked Whale Mass Stranding (26-27 January 2006)

Description: The Spanish Cetacean Society reported an atypical mass stranding of four beaked whales that occurred January 26 to 28, 2006, on the southeast coast of Spain near Mojacar (Gulf of Vera) in the Western Mediterranean Sea. According to the report, two of the whales were discovered the evening of January 26 and were found to be still alive. Two other whales were discovered on January 27, but had already died. A following report stated that the first three animals were located near the town of Mojacar and were examined by a team from the University of Las Palmas de Gran Canarias, with the help of the stranding network of Ecologistas en Acción Almería-PROMAR and others from the Spanish Cetacean Society. The fourth animal was found dead on the afternoon of January 27, a few kilometers north of the first three animals.

From January 25-26, 2006, a NATO surface ship group (seven ships including one U.S. ship under NATO operational command) conducted active sonar training against a Spanish submarine within 50 nm of the stranding site.

Findings: Veterinary pathologists necropsied the two male and two female beaked whales (*Z. cavirostris*).

Conclusions: According to the pathologists, a likely cause of this type of beaked whale mass stranding event may have been anthropogenic acoustic activities. However, no detailed pathological results

confirming this supposition have been published to date, and no positive acoustic link was established as a direct cause of the stranding.

Even though no causal link can be made between the stranding event and naval exercises, certain conditions may have existed in the exercise area that, in their aggregate, may have contributed to the marine mammal strandings (Freitas, 2004):

- Operations were conducted in areas of at least 1000 meters in depth near a shoreline where there is a rapid change in bathymetry on the order of 1000 to 6000 meters occurring a cross a relatively short horizontal distance (Freitas, 2004).

- Multiple ships, in this instance, five MFA sonar equipped vessels, were operating in the same area over extended periods (20 hours) in close proximity.

- Exercises took place in an area surrounded by landmasses, or in an embayment. Operations involving multiple ships employing mid-frequency active sonar near land may produce sound directed towards a channel or embayment that may cut off the lines of egress for marine mammals (Freitas, 2004).

F.1.6.2 Other Global Stranding Discussions

In the following sections, stranding events that have been linked to U.S. Navy activity in popular press are presented. As detailed in the individual case study conclusions, the U.S. Navy believes there is enough evidence available to refute allegations of impacts from mid-frequency sonar, or at least indicate a substantial degree of uncertainty in time and space that precludes a meaningful scientific conclusion.

Case Studies of Stranding Events

2003 Washington State Harbor Porpoise Strandings (May 2 – June 2 2003)

Description: At 1040 hours on May 5, 2003, the USS SHOUP began the use of mid-frequency tactical active sonar as part of a naval exercise. At 1420, the USS SHOUP entered the Haro Strait and terminated active sonar use at 1438, thus limiting active sonar use within the strait to less than 20 minutes. Between May 2 and June 2, 2003, approximately 16 strandings involving 15 harbor porpoises (*Phocoena phocoena*) and one Dall's porpoise (*Phocoenoides dalli*) were reported to the Northwest Marine Mammal Stranding Network. A comprehensive review of all strandings and the events involving USS SHOUP on May 5, 2003 were presented in U.S. Department of Navy (2004). Given that the USS SHOUP was known to have operated sonar in the strait on May 5, and that supposed behavioral reactions of killer whales (*Orcinus orca*) had been putatively linked to these sonar operations (NMFS Office of Protected Resources, 2005), NMFS undertook an analysis of whether sonar caused the strandings of the harbor porpoises.

Whole carcasses of ten harbor porpoises and the head of an additional porpoise were collected for analysis. Necropsies were performed on ten of the porpoises and six whole carcasses, and two heads were selected for CT imaging. Gross examination, histopathology, age determination, blubber analysis, and various other analyses were conducted on each of the carcasses (Norman et al., 2004).

Findings: Post-mortem findings and analysis details are found in Norman et al. (2004). All of the carcasses suffered from some degree of freeze-thaw artifact that hampered gross and histological evaluations. At the time of necropsy, three of the porpoises were moderately fresh, whereas the remainder of the carcasses was considered to have moderate to advanced decomposition. None of the 11 harbor porpoises demonstrated signs of acoustic trauma. In contrast, a putative cause of death was determined for five of the porpoises; two animals had blunt trauma injuries and three animals had indication of disease processes (fibrous peritonitis, salmonellosis, and necrotizing pneumonia). A cause of death could not be determined in the remaining animals, which is consistent with expected percentage of marine mammal

necropsies conducted within the Northwest region. It is important to note, however, that these determinations were based only on the evidence from the necropsy to avoid bias with regard to determinations of the potential presence or absence of acoustic trauma. The result was that other potential causal factors, such as one animal (Specimen 33NWR05005) found tangled in a fishing net, was unknown to the investigators in their determination regarding the likely cause of death.

Conclusions: NMFS concluded from a retrospective analysis of stranding events that the number of harbor porpoise stranding events in the approximate month surrounding the USS SHOUP use of sonar was higher than expected based on annual strandings of harbor porpoises (Norman et al., 2004). In this regard, it is important to note that the number of strandings in the May-June timeframe in 2003 was also higher for the outer coast indicating a much wider phenomena than use of sonar by USS SHOUP in Puget Sound for one day in May. The conclusion by NMFS that the number of strandings in 2003 was higher is also different from that of The Whale Museum, which has documented and responded to harbor porpoise strandings since 1980 (Osborne, 2003). According to The Whale Museum, the number of strandings as of May 15, 2003, was consistent with what was expected based on historical stranding records and was less than that occurring in certain years. For example, since 1992 the San Juan Stranding Network has documented an average of 5.8 porpoise strandings per year. In 1997 there were 12 strandings in the San Juan Islands with more than 30 strandings throughout the general Puget Sound area. Disregarding the discrepancy in the historical rate of porpoise strandings and its relation to the USS SHOUP, NMFS acknowledged that the intense level of media attention focused on the strandings likely resulted in an increased reporting effort by the public over that which is normally observed (Norman et al., 2004). NMFS also noted in its report that the "sample size is too small and biased to infer a specific relationship with respect to sonar usage and subsequent strandings."

Seven of the porpoises collected and analyzed died prior to SHOUP departing to sea on May 5, 2003. Of these seven, one, discovered on May 5, 2003, was in a state of moderate decomposition, indicating it died before May 5; the cause of death was determined, most likely, to be salmonella septicemia. Another porpoise, discovered at Port Angeles on May 6, 2003, was in a state of moderate decomposition, indicating that this porpoise also died prior to May 5. One stranded harbor porpoise discovered fresh on May 6 is the only animal that could potentially be linked in time to the USS SHOUP's May 5 active sonar use. Necropsy results for this porpoise found no evidence of acoustic trauma. The remaining eight strandings were discovered one to three weeks after the USS SHOUP's May 5 transit of the Haro Strait, making it difficult to causally link the sonar activities of the USS SHOUP to the timing of the strandings. Two of the eight porpoises died from blunt trauma injury and a third suffered from parasitic infestation, which possibly contributed to its death (Norman et al. 2004). For the remaining five porpoises, NMFS was unable to identify the causes of death.

Additionally, it has become clear that the number of harbor porpoise strandings in the Northwest increased beginning in 2003 and through 2006. Figure F-3 shows the number of strandings documented in the Northwest for harbor porpoises. On November 3, 2006, a UME in the Pacific Northwest was declared. In 2006, a total of 66 harbor porpoise strandings were reported in the Outer Coast of Oregon and Washington and Inland waters of Washington (NOAA Fisheries, 2006; NOAA Fisheries, Northwest Region, 2006a).

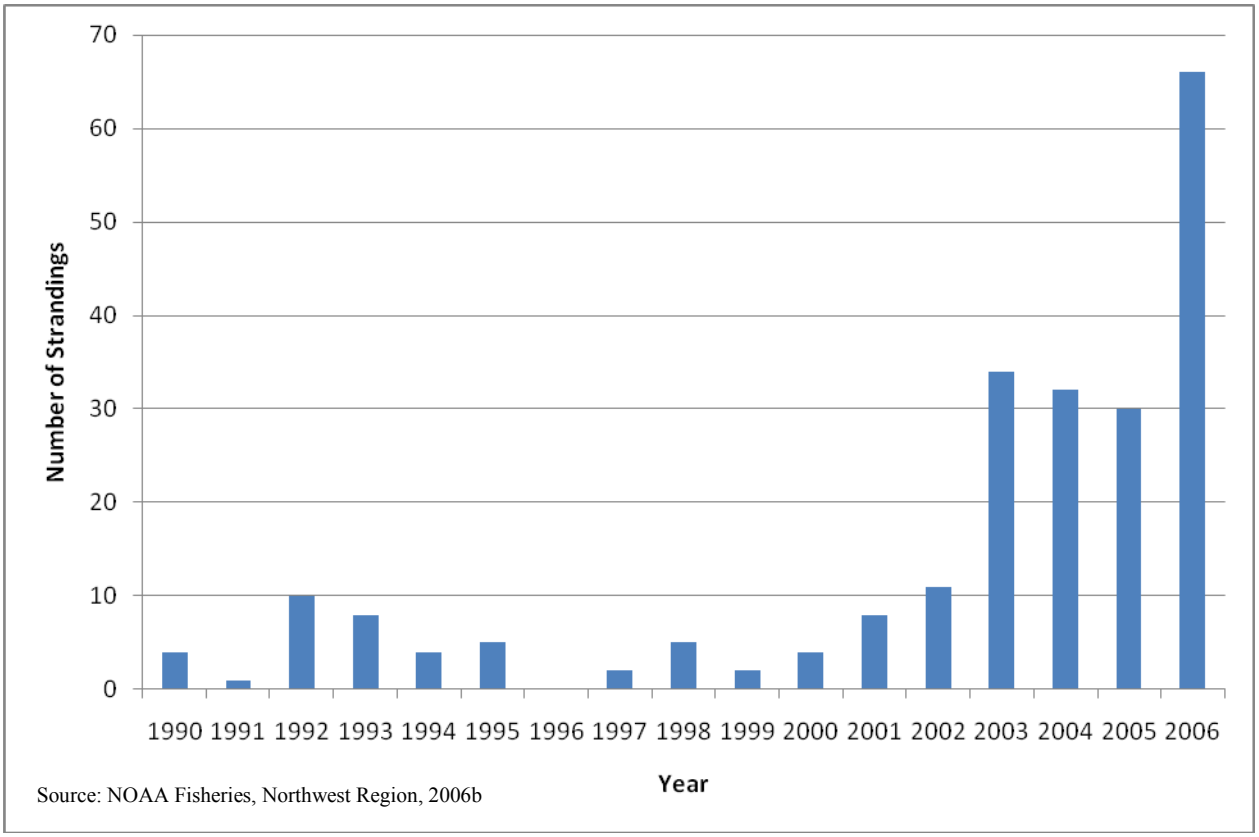


Figure F-3. Northwest Region Harbor Porpoise Strandings 1990 – 2006

The speculative association of the harbor porpoise strandings to the use of sonar by the USS SHOUP is inconsistent with prior stranding events linked to the use of mid-frequency sonar. Specifically, in prior events, the stranding of whales occurred over a short period of time (less than 36 hours), stranded individuals were spatially co-located, traumas in stranded animals were consistent between events, and active sonar was known or suspected to be in use. Although mid-frequency active sonar was used by the USS SHOUP, the distribution of harbor porpoise strandings by location and with respect to time surrounding the event do not support the suggestion that mid-frequency active sonar was a cause of harbor porpoise strandings. Rather, a complete lack of evidence of any acoustic trauma within the harbor porpoises, and the identification of probable causes of stranding or death in several animals, further supports the conclusion that harbor porpoise strandings were unrelated to the sonar activities of the USS SHOUP.

Additional allegations regarding USS SHOUP use of sonar having caused behavioral effects to Dall's porpoise, orca, and a minke whale also arose in association with this event (see U.S. Department of Navy 2004 for a complete discussion).

Dall's porpoise: Information regarding the observation of Dall's porpoise on May 5, 2003 came from the operator of a whale watch boat at an unspecified location. This operator reported the Dall's porpoise were seen "going north" when the SHOUP was estimated by him to be 10 miles away. Potential reasons for the Dall's movement include the pursuit of prey, the presence of harassing resident orca or predatory transient orca, vessel disturbance from one of many whale watch vessels, or multiple other unknowable reasons including the use of sonar by SHOUP. In short, there was nothing unusual in the observed behavior of the Dall's porpoise on May 5, 2003 and no way to assess if the otherwise normal behavior was in reaction to the use of sonar by USS SHOUP, any other potential causal factor or a combination of factors.

Orca: Observer opinions regarding orca J-Pod behaviors on 5 May 2003 were inconsistent, ranging from the orca being "at ease with the sound" or "resting" to their being "annoyed." One witness reported observing "low rates of surface active behavior" on behalf of the orca J-Pod, which is in conflict with that of another observer who reported variable surface activity, tail slapping and spyhopping. Witnesses also expressed the opinion that the behaviors displayed by the orca on 5 May 2003 were "extremely unusual," although those same behaviors are observed and reported regularly on the Orca Network Website, are behaviors listed in general references as being part of the normal repertoire of orca behaviors. Given the contradictory nature of the reports on the observed behavior of the J-Pod orca, there is no way to assess if any unusual behaviors were present or if present they were in reaction to vessel disturbance from one of many nearby whale watch vessels, use of sonar by SHOUP, any other potential causal factor, or a combination of factors.

Minke whale: A minke whale was reported porpoising in Haro Strait on May 5, 2003, which is a rarely observed behavior. The cause of this behavior is indeterminate given multiple potential causal factors including but not limited to the presence of predatory Transient orca, possible interaction with whale watch boats, other vessels, or SHOUP's use of sonar. Given the existing information, there is no way to be certain if the unusual behavior observed was in reaction to the use of sonar by SHOUP, any other potential causal factor or a combination of factors.

2004 Alaska Beaked Whale Strandings (Northern Edge Exercise, 7-16 June 2004)

Description: Between 27 June and 19 July 2004, five beaked whales were discovered at various locations along 1,600 miles of the Alaskan coastline and one was found floating (dead) at sea. These whales included three Baird's beaked whales and two Cuvier's beaked whales. Questions and comments posed on previous Navy environmental documents have alleged that sonar use may have been the cause of these strandings in association with the Navy Alaska Shield/Northern Edge exercise, which occurred June 7 to June 16, 2004 (within the approximate timeframe of these strandings).

Findings: Information regarding the strandings is incomplete as the whales had been dead for some time before they were discovered. The stranded beaked whales were in moderate to advanced states of decomposition and necropsies were not performed. Additionally, prior to the Navy conducting the Alaska Shield/Northern Edge exercise, two Cuvier's beaked whales were discovered stranded at two separate locations along the Alaskan coastline (February 26 at Yakutat and June 1 at Nuka Bay).

Zimmerman (1991) reported that between 1975 and 1987, 11 species of cetaceans were found stranded in Alaska seven or more times, including 29 Stejneger's beaked whales, 19 Cuvier's beaked whales, and 8 Baird's beaked whales. Cuvier's beaked whales have been found stranded from the eastern Gulf of Alaska to the western Aleutians. Baird's beaked whales were found stranded as far north as the area between Cape Pierce and Cape Newenham, east near Kodiak, and along the Aleutian Islands. (Zimmerman, 1991). In short, however, the stranding of beaked whales in Alaska is a relatively uncommon occurrence (as compared to other species).

Conclusions: The at-sea portion of the Alaska Shield/Northern Edge 2004 exercise consisted mainly surface ships and aircraft tracking a vessel of interest followed by a vessel boarding search and seizure event. There was no ASW component to the exercise, no use of mid-frequency sonar, and no use of explosives in the water. There were no events in the Alaska Shield/Northern Edge exercise that could have caused or been related to any of the strandings over this 33 day period along 1,600 miles of coastline.

2004 Hawai'i Melon-Headed Whale Unusual Milling Event (July 3-4 2004)

Description: The majority of the following information is taken from the NMFS report (which referred to the event as a "mass stranding event"; Southall et al., 2006) but includes additional and new information not presented in the NMFS report. On the morning of July 3, 2004, between 150 and 200 melon-headed whales (*Peponocephala electra*) entered Hanalei Bay, Kauai. Individuals attending a canoe blessing ceremony observed the animals entering the bay at approximately 7:00 a.m. The whales were reported entering the bay in a "wave as if they were chasing fish" (Braun 2006). At 6:45 a.m. on July 3, 2004, approximately 25 nm north of Hanalei Bay, active sonar was tested briefly prior to the start of an anti-submarine warfare exercise.

The whales stopped in the southwest portion of the bay, grouping tightly, and displayed spy-hopping and tail-slapping behavior. As people went into the water among the whales, the pod separated into as many as four groups, with individual animals moving among the clusters. This continued through most of the day, with the animals slowly moving south and then southeast within the bay. By about 3 p.m., police arrived and kept people from interacting with the animals. The Navy believes that the abnormal behavior by the whales during this time is likely the result of people and boats in the water with the whales rather than the result of sonar activities taking place 25 or more miles off the coast. At 4:45 p.m. on July 3, 2004, the RIMPAC Battle Watch Captain received a call from a National Marine Fisheries representative in Honolulu, Hawaii, reporting the sighting of as many as 200 melon-headed whales in Hanalei Bay. At 4:47 p.m. the Battle Watch Captain directed all ships in the area to cease active sonar transmissions.

At 7:20 p.m. on July 3, 2004, the whales were observed in a tight single pod 75 yards from the southeast side of the bay. The pod was circling in a group and displayed frequent tail slapping and whistle vocalizations and some spy hopping. No predators were observed in the bay and no animals were reported as having fresh injuries. The pod stayed in the bay through the night of July 3, 2004. On the morning of July 4, 2004, the whales were observed to still be in the bay and collected in a tight group. A decision was made at that time to attempt to herd the animals out of the bay. A 700-to-800-foot rope was constructed by weaving together beach morning glory vines. This vine rope was tied between two canoes and with the assistance of 30 to 40 kayaks, was used to herd the animals out of the bay. By approximately 11:30 a.m. on July 4, 2004, the pod was coaxed out of the bay.

A single neonate melon-headed whale was observed in the bay on the afternoon of July 4, after the whale pod had left the bay. The following morning on July 5, 2004, the neonate was found stranded on Lumahai Beach. It was pushed back into the water but was found stranded dead between 9 and 10 a.m. near the Hanalei pier. NMFS collected the carcass and had it shipped to California for necropsy, tissue collection, and diagnostic imaging.

Following the unusual milling event, NMFS undertook an investigation of possible causative factors of the event. This analysis included available information on environmental factors, biological factors, and an analysis of the potential for sonar involvement. The latter analysis included vessels that utilized mid-frequency active sonar on the afternoon and evening of July 2. These vessels were to the southeast of Kauai, on the opposite side of the island from Hanalei Bay.

Findings: NMFS concluded from the acoustic analysis that the melon-headed whales would have had to have been on the southeast side of Kauai on July 2 to have been exposed to sonar from naval vessels on that day (Southall et al. 2006). There was no indication whether the animals were in that region or whether they were elsewhere on July 2. NMFS concluded that the animals would have had to swim from 1.4-4.0 m/s for 6.5 to 17.5 hours after sonar transmissions ceased to reach Hanalei Bay by 7:00 a.m. on July 3. Sound transmissions by ships to the north of Hanalei Bay on July 3 were produced as part of exercises between 6:45 a.m. and 4:47 p.m. Propagation analysis conducted by the 3rd Fleet estimated that

the level of sound from these transmissions at the mouth of Hanalei Bay could have ranged from 138-149 dB re: 1 µPa.

NMFS was unable to determine any environmental factors (e.g., harmful algal blooms, weather conditions) that may have contributed to the stranding. However, additional analysis by Navy investigators found that a full moon occurred the evening before the stranding and was coupled with a squid run (Mobley 2007). One of the first observations of the whales entering the bay reported the pod came into the bay in a line "as if chasing fish" (Braun, 2005). In addition, a group of 500 to700 melon-headed whales were observed to come close to shore and interact with humans in Sasanhaya Bay, Rota, on the same morning as the whales entered Hanalei Bay (Jefferson et al. 2006). Previous records further indicated that, though the entrance of melon-headed whales into the shallows is rare, it is not unprecedented. A pod of melon-headed whales entered Hilo Bay in the 1870s in a manner similar to that which occurred at Hanalei Bay in 2004.

The necropsy of the melon-headed whale calf suggested that the animal died from a lack of nutrition, possibly following separation from its mother. The calf was estimated to be approximately one week old. Although the calf appeared not to have eaten for some time, it was not possible to determine whether the calf had ever nursed after it was born. The calf showed no signs of blunt trauma or viral disease and had no indications of acoustic injury.

Conclusions: Although it is not impossible, it is unlikely that the sound level from the sonar caused the melon-headed whales to enter Hanalei Bay. This conclusion is based on a number of factors:

1. The speculation that the whales may have been exposed to sonar the day before and then fled to the Hanalei Bay is not supported by reasonable expectation of animal behavior and swim speeds. The flight response of the animals would have had to persist for many hours following the cessation of sonar transmissions. Such responses have not been observed in marine mammals and no documentation exists that such persistent flight response after the cessation of a frightening stimulus has been observed in other mammals. The swim speeds, though feasible for the species, are highly unlikely to be maintained for the durations proposed, particularly since the pod was a mixed group containing both adults and neonates. Whereas adults may maintain a swim speed of 4.0 m/s for some time, it is improbable that a neonate could achieve the same for a period of many hours.

2. The area between the islands of Oahu and Kauai and the Pacific Missile Range Facility training range have been used in RIMPAC exercises for more than 30 years, and are used year-round for ASW training with mid frequency active sonar. Melon-headed whales inhabiting the waters around Kauai are likely not naive to the sound of sonar and there has never been another stranding event associated in time with ASW training at Kauai. Similarly, the waters surrounding Hawaii contain an abundance of marine mammals, many of which would have been exposed to the same sonar operations that were speculated to have affected the melon-headed whales. No other strandings were reported coincident with the RIMPAC exercises. This leaves it uncertain as to why melon-headed whales, and no other species of marine mammal, would respond to the sonar exposure by stranding.

3. At the nominal swim speed for melon-headed whales, the whales had to be within 1.5 to 2 nm of Hanalei Bay before sonar was activated on July 3. The whales were not in their open ocean habitat but had to be close to shore at 6:45 a.m. when the sonar was activated to have been observed inside Hanalei Bay from the beach by 7 a.m. (Hanalei Bay is very large area). This observation suggests that other potential factors could have caused the event (see below).

4. The simultaneous movement of 500 to 700 melon-headed whales and Risso's dolphins into Sasanhaya Bay, Rota, in the Northern Marianas Islands on the same morning as the 2004 Hanalei stranding (Jefferson et al., 2006) suggests that there may be a common factor which prompted the melon-headed

whales to approach the shoreline. A full moon occurred the evening before the stranding and a run of squid was reported concomitant with the lunar activity (Mobley et al. 2007). Thus, it is possible that the melon-headed whales were capitalizing on a lunar event that provided an opportunity for relatively easy prey capture (Mobley et al. 2007). A report of a pod entering Hilo Bay in the 1870s indicates that on at least one other occasion, melon-headed whales entered a bay in a manner similar to the occurrence at Hanalei Bay in July 2004. Thus, although melon-headed whales entering shallow embayments may be an infrequent event, and every such event might be considered anomalous, there is precedent for the occurrence.

5. The received noise sound levels at the bay were estimated to range from roughly 95 to 149 dB re: 1 µPa. Received levels as a function of time of day have not been reported, so it is not possible to determine when the presumed highest levels would have occurred and for how long. However, received levels in the upper range would have been audible by human participants in the bay. The statement by one interviewee that he heard "pings" that lasted an hour and that they were loud enough to hurt his ears is unreliable. Received levels necessary to cause pain over the duration stated would have been observed by most individuals in the water with the animals. No other such reports were obtained from people interacting with the animals in the water.

Although NMFS concluded that sonar use was a "plausible, if not likely, contributing factor in what may have been a confluence of events (Southall et al. 2006)," this conclusion was based primarily on the basis that there was an absence of any other compelling explanation. The authors of the NMFS report on the incident were unaware, at the time of publication, of the simultaneous event in Rota. In light of the simultaneous Rota event, the Hanalei event does not appear as anomalous as initially presented and the speculation that sonar was a causative factor is weakened. The Hanalei Bay incident does not share the characteristics observed with other mass strandings of whales coincident with sonar activity (e.g., specific traumas, species composition, etc.). In addition, the inability to conclusively link or exclude the impact of other environmental factors makes a causal link between sonar and the melon-headed whale event highly speculative at best.

1980- 2004 Beaked Whale Strandings in Japan (Brownell et al. 2004)

Description: Brownell et al. (2004) compare the historical occurrence of beaked whale strandings in Japan (where there are U.S. Naval bases), with strandings in New Zealand (which lacks a U.S. Naval base) and concluded the higher number of strandings in Japan may be related to the presence of the US. Navy vessels using mid-frequency sonar. While the dates for the strandings were well documented, the authors of the study did not attempt to correlate the dates of any navy activities or exercises with those stranding dates.

To fully investigate the allegation made by Brownell et al. (2004), the Center for Naval Analysis (CNA) in an internal Navy report, looked at past U.S. Naval exercise schedules from 1980 to 2004 for the water around Japan in comparison to the dates for the strandings provided by Brownell et al. (2004). None of the strandings occurred during or soon (within weeks) after any U.S. Navy exercises. While the CNA analysis began by investigating the probabilistic nature of any co-occurrences, the strandings and sonar use were not correlated by time. Given that there was no instance of co-occurrence in over 20 years of stranding data, it can be reasonably postulated that sonar use in Japan waters by U.S. Navy vessels did not lead to any of the strandings documented by Brownell et al. (2004).

2005 North Carolina Marine Mammal Mass Stranding Event (January 15-16, 2005)

Description: On January 15 and 16, 2005, 36 marine mammals consisting of 33 short-finned pilot whales, one minke whale, and two dwarf sperm whales stranded alive on the beaches of North Carolina (Hohn et al., 2006a). The animals were scattered across a 111-km area from Cape Hatteras northward. Because of

the live stranding of multiple species, the event was classified as a UME. It is the only stranding on record for the region in which multiple offshore species were observed to strand within a two- to three-day period.

The U.S. Navy indicated that from January 12-14 some unit level training with mid-frequency active sonar was conducted by vessels that were 93 to 185 km from Oregon Inlet. An expeditionary strike group was also conducting exercises to the southeast, but the closest point of active sonar transmission to the inlet was 650 km away. The unit level operations were not unusual for the area or time of year and the vessels were not involved in antisubmarine warfare exercises. Marine mammal observers on board the vessels did not detect any marine mammals during the period of unit level training. No sonar transmissions were made on January 15-16.

The National Weather Service reported that a severe weather event moved through North Carolina on January 13 and 14. The event was caused by an intense cold front that moved into an unusually warm and moist air mass that had been persisting across the eastern United States for about a week. The weather caused flooding in the western part of the state, considerable wind damage in central regions of the state, and at least three tornadoes that were reported in the north central part of the state. Severe, sustained (one to four days) winter storms are common for this region.

Over a two-day period (January 16-17), two dwarf sperm whales, 27 pilot whales, and the minke whale were necropsied and tissue samples collected. Twenty-five of the stranded cetacean heads were examined; two pilot whale heads and the heads of the dwarf sperm whales were analyzed by CT.

Findings: The pilot whales and dwarf sperm whale were not emaciated, but the minke whale, which was believed to be a dependent calf, was emaciated. Many of the animals were on the beach for an extended period of time prior to necropsy and sampling, and many of the biochemical abnormalities noted in the animals were suspected of being related to the stranding and prolonged time on land. Lesions were observed in all of the organs, but there was no consistency across species. Musculoskeletal disease was observed in two pilot whales and cardiovascular disease was observed in one dwarf sperm whale and one pilot whale. Parasites were a common finding in the pilot whales and dwarf sperm whales but were considered consistent with the expected parasite load for wild odontocetes. None of the animals exhibited traumas similar to those observed in prior stranding events associated with mid-frequency sonar activity. Specifically, there was an absence of auditory system trauma and no evidence of distributed and widespread bubble lesions or fat emboli, as was previously observed (Fernández et al., 2005).

Sonar transmissions prior to the strandings were limited in nature and did not share the concentration identified in previous events associated with mid-frequency active sonar use (Evans and England, 2001). The operational/environmental conditions were also dissimilar (e.g., no constrictive channel and a limited number of ships and sonar transmissions). NMFS noted that environmental conditions were favorable for a shift from up-welling to down-welling conditions, which could have contributed to the event. However, other severe storm conditions existed in the days surrounding the strandings and the impact of these weather conditions on at-sea conditions is unknown. No harmful algal blooms were noted along the coastline.

Conclusions: All of the species involved in this stranding event are known to occasionally strand in this region. Although the cause of the stranding could not be determined, several whales had preexisting conditions that could have contributed to the stranding. Cause of death for many of the whales was likely due to the physiological stresses associated with being stranded. A consistent suite of injuries across species, which was consistent with prior strandings where sonar exposure is expected to be a causative mechanism, was not observed.

NMFS was unable to determine any causative role that sonar may have played in the stranding event. The acoustic modeling performed, as in the Hanalei Bay incident, was hampered by uncertainty regarding the location of the animals at the time of sonar transmissions. However, as in the Hanalei Bay incident, the response of the animals following the cessation of transmissions would imply a flight response that persisted for many hours after the sound source was no longer operational. In contrast, the presence of a severe weather event passing through North Carolina during January 13 and 14 is a possible, if not likely, contributing factor to the North Carolina UME of January 15. Hurricanes may have been responsible for mass strandings of pygmy killer whales in the British Virgin Islands and Gervais' beaked whales in North Carolina (Mignucci-Giannoni et al. 2000; Norman and Mead 2001).

F.1.6.3 Causal Associations for Stranding Events

Several stranding events have been associated with Navy sonar activities but relatively few of the total stranding events that have been recorded occurred spatially or temporally with Navy sonar activities. While sonar may be a contributing factor under certain rare conditions, the presence of sonar it is not a necessary condition for stranding events to occur. In established range areas such as those in Hawaii and Southern California where sonar use has been routine for decades, there is no evidence of impacts from sonar use on marine mammals.

A review of past stranding events associated with sonar suggest that the potential factors that may contribute to a stranding event are steep bathymetry changes, narrow channels, multiple sonar ships, surface ducting and the presence of beaked whales that may be more susceptible to sonar exposures. The most important factors appear to be the presence of a narrow channel (e.g. Bahamas and Madeira Island, Portugal) that may prevent animals from avoiding sonar exposure and multiple sonar ships within that channel. There are no narrow channels (less than 35 nm wide and 10 nm in length) in the MAA and the ships would be spread out over a wider area allowing animals to move away from sonar activities if they choose. In addition, beaked whales may not be more susceptible to sonar but may favor habitats that are more conducive to sonar effects. There have been no mass strandings in GOA attributed to Navy sonar during any of the prior Northern Edge exercises or as the result of ay Navy sonar use.

F.1.7 Stranding Section Conclusions

Marine mammal strandings have been a historic and ongoing occurrence attributed to a variety of causes. Over the last 50 years, increased awareness and reporting has lead to more information about species effected and raised concerns about anthropogenic sources of stranding. While there has been some marine mammal mortalities potentially associated with mid-frequency sonar effects to a small number of species (primarily limited numbers of certain species of beaked whales), the significance and actual causative reason for any impacts is still subject to continued investigation.

By comparison and as described previously, potential impacts to all species of cetaceans worldwide from fishery related mortality can be orders of magnitude more significant (100,000s of animals versus tens of animals) (Culik, 2002; ICES, 2005b; Read et al., 2006). This does not negate the influence of any mortality or additional stressor to small, regionalized sub-populations which may be at greater risk from human related mortalities (fishing, vessel strike, sound) than populations with larger oceanic level distribution or migrations. ICES (2005a) noted, however, that taken in context of marine mammal populations in general, sonar is not a major threat, nor is it a significant portion of the overall ocean noise budget.

In conclusion, a constructive framework and continued research based on sound scientific principles is needed in order to avoid speculation as to stranding causes, and to further our understanding of potential effects or lack of effects from military mid-frequency sonar (Bradshaw et al., 2005; ICES, 2005b; Barlow and Gisiner, 2006; Cox et al., 2006).

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Appendix G

Public Participation

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G PUBLIC PARTICIPATION

This appendix includes information about the public's participation in the development of the Gulf of Alaska (GOA) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). The first part of this appendix summarizes the public scoping process that began with the publication of the Notice of Intent (NOI) in the *Federal Register* in March 2008. The scoping period allowed a variety of opportunities for the public to comment on the scope of the EIS/OEIS, and included three public scoping meetings.

The second part of this appendix addresses the public's involvement in reviewing and commenting on the Draft EIS/OEIS. This section includes a summary of the Navy's public involvement efforts, including information about public hearings, media advertisements and notifications, letters to stakeholders, and meeting flyers. As part of this phase of public involvement, the Navy received comments to the Draft EIS/OEIS from individuals, agencies, elected officials, organizations, and tribes. These comments and the Navy's response to them are addressed in Appendix I, *Pubic Comments and Responses*.

G.1 PROJECT WEBSITE

A public website was established specifically for this project, http://www.gulfofalaskanavyeis.com/ and went active on March 14th, 2008. This website address was published in the initial Notice of Intent and has subsequently been re-printed in all newspaper advertisements, agency letters, and public postcards for both the Notice of Intent to Prepare an Environment Impact Statement and Notice of Availability of the Draft Environmental Impact Statement. The Draft EIS/OEIS, Scoping Meeting Fact Sheets, and various other materials have been available on the project website throughout the course of the project.

G.2 GENERAL SUMMARY OF THE SCOPING PERIOD

The scoping period for the Navy Training Activities in the GOA EIS/ OEIS began with publication of a Notice of Intent in the Federal Register on 17 March 2008. The scoping period began on this date and lasted 45 days, concluding on 30 April 2008. Three public scoping meetings were held on April 1, 2 and 3 in the cities of Kodiak, Anchorage, and Cordova, Alaska, respectively. The scoping meetings were held in an open house format, with informational posters and written information provided to participants and Navy staff and project experts were available to answer participants' questions. Additionally, a tape recorder was available to record participants' oral comments. The interaction during the information sessions was productive and helpful to the Navy.

Scoping participants could submit comments in five ways:

- Oral statements at the public meetings (as recorded by the tape recorder);
- Written comments at the public meetings;
- Written letters (received any time during the public comment period);
- Electronic mail (received any time during the public comment period); and
- Comments submitted directly on the project website (received any time during the public comment period).

G.2.1 Public Scoping Notification

The Navy made significant efforts at notifying the public to ensure maximum public participation during the scoping process. A summary of these efforts follows.

G.2.1.1 Federal Register Notice

A Notice of Intent and Notice of Public Scoping Meetings was published in the *Federal Register* on March 17, 2008.

G.2.1.2 Newspaper Display Advertisements

Advertisements were made to announce the scoping meetings in the following newspapers on the dates indicated below:

Anchorage Daily News
Tuesday, March 18th 2008
Wednesday, March 19th 2008
Thursday, March 20th 2008
Tuesday, April 1st 2008
Wednesday, April 2nd 2008 (Day of Meeting)

Peninsula Clarion
Tuesday, March 18th 2008
Wednesday, March 19th 2008
Thursday, March 20th 2008
Tuesday, April 1st 2008
Wednesday, April 2nd 2008 (Day of Meeting)

Kodiak Daily Mirror
Tuesday, March 18th 2008
Wednesday, March 19th 2008
Thursday, March 20th 2008
Monday, March 31st 2008
Tuesday, April 1st 2008 (Day of Meeting)

Cordova Times
Tuesday, March 18th 2008
Wednesday, March 19th 2008
Thursday, March 20th 2008
Thursday, March 27th 2008
Thursday, April 3rd 2008 (Day of Meeting)

G.2.1.3 Scoping Notification Letters

Notice of Intent/Notice of Scoping Meeting Letters were distributed on March 17, 2008 and included the notice of intent to prepare an EIS/OEIS and notification of scoping meetings. Recipients included:

Tribes and Nations

- Kaguyak Village
- Lesnoi Village
- Native Village of Afognak
- Native Village of Chenega
- Native Village of Eyak
- Native Village of Old Harbor
- Native Village of Ouzinkie
- Native Village of Port Graham
- Native Village of Port Lions
- Native Village of Tatitlek
- Shoonaq Tribe of Kodiak
- Yakutat Tlingit Tribe

Elected Officials

Federal:

- U.S. Senator, Alaska
- U.S. Senator, Alaska
- U.S. Representative, Alaska

State:

- Governor of Alaska
- Alaska State Senator, Alaska District A
- Alaska State Senator, Alaska District B
- Alaska State Senator, Alaska District C
- Alaska State Senator, Alaska District D
- Alaska State Senator, Alaska District E
- Alaska State Senator, Alaska District F
- Alaska State Senator, Alaska District G
- Alaska State Senator, Alaska District H
- Alaska State Senator, Alaska District I
- Alaska State Senator, Alaska District J
- Alaska State Senator, Alaska District K
- Alaska State Senator, Alaska District L
- Alaska State Senator, Alaska District M
- Alaska State Senator, Alaska District N
- Alaska State Senator, Alaska District O
- Alaska State Senator, Alaska District P
- Alaska State Senator, Alaska District Q
- Alaska State Senator, Alaska District R
- Alaska State Senator, Alaska District S
- Alaska State Senator, Alaska District T
- Alaska State Representative, Alaska District 1
- Alaska State Representative, Alaska District 2
- Alaska State Representative, Alaska District 3
- Alaska State Representative, Alaska District 4
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- Alaska State Representative, Alaska District 36
- Alaska State Representative, Alaska District 37
- Alaska State Representative, Alaska District 38
- Alaska State Representative, Alaska District 39
- Alaska State Representative, Alaska District 40

Local:

- Mayor, Fairbanks North Star Borough
- Mayor, Kenai Peninsula Borough, Mayor
- Mayor, Kodiak Island Borough
- Mayor, Matanuska-Susitna Borough
- Mayor, Municipality of Anchorage
- Mayor, City of Cordova
- Mayor, City/Borough of Juneau

Federal Regulatory and Government Agencies

- Federal Aviation Administration
    - Washington D.C. headquarters
    - Alaska Region
    - Navy Liaison Officer
- Marine Mammal Commission
- National Oceanic and Atmospheric Administration
- National Marine Fisheries Service
    - Washington D.C. headquarters
    - Alaska Region
    - Office of Protected Resources
    - Habitat Conservation Division
    - Alaska Fisheries Science Center
- North Pacific Fisheries Management Council
- U.S. Army Corps of Engineers
    - Alaska District
- U.S. Department of the Air Force
- U.S. Department of the Army
    - Environmental Resources Division
- U.S. Coast Guard
    - Headquarters Office of Operating and Environmental Standards
    - District 17
- U.S. Department of the Interior
    - Bureau of Indian Affairs
    - Bureau of Land Management

- Environmental Policy & Compliance Department
- Minerals Management Service, Alaska Outer Continental Shelf Region
- National Park Service, Glacier Bay
- U.S. Fish & Wildlife Service, Alaska Region
- U.S. Geological Survey, Alaska Science Center and Western Fisheries Research Center

- U.S. Environmental Protection Agency
  - Washington D.C. headquarters
  - Region X
- U.S. Fish and Wildlife Service
- U.S. Department of Agriculture
  - U.S. Forest Service, Alaska Region
- U.S. Department of Commerce

State Regulatory and Government Agencies

- Alaska Department of Fish and Game
- Alaska Department of Natural Resources
- Alaska Department of Commerce and Economic Development
- Alaska Department of Environmental Conservation
- Alaska Department of Transportation & Public Facilities
- Alaska Office of History and Archaeology
- Regulatory Commission of Alaska
- Alaska Department of Military and Veterans Affairs

G.2.2 Public Scoping Comments

In total, the Navy received comments from 77 individuals or organizations. These comments included 52 comments via the website, 18 comments via mail, and 7 comments made in person during the public scoping meetings. This summary gives an overview of comments received during the scoping period. Comments are organized by issue area.

G.2.2.1 Air Quality

Comments in this category expressed concern about the effects of military activities on air quality, specifically from carbon dioxide (CO_2) and greenhouse gases and their effects on global warming. Additional commenters expressed concerns with black carbon exhaust emissions from Navy vessels and their warming impact in the Arctic. Compliance with the Clean Air Act (CAA) was also mentioned. Commenters noted that the EIS/OEIS should discuss which areas do not meet National Ambient Air Quality Standards.

G.2.2.2 Alternatives

Comments regarding alternatives suggested that the Navy consider other sites to conduct its activities. Several commenters expressed that, of the three alternatives, they could only support the No Action Alternative. Additional comments expressed general disappointment with use of the term "No Action Alternative" to refer to continuing activities at current levels.

G.2.2.3 Biological Resources – Marine Mammals, Fish, Birds and Marine Habitat

The majority of comments received in this focus area expressed concerns about impacts to marine life. Many of these comments specifically raised concerns about the effect of Navy sonar on marine life, such as marine mammals, fish, sea turtles, sea invertebrates and zooplankton. Numerous comments were made about the number of endangered species in the GOA, particularly whales (seven whale species in total) and the North Pacific Right Whale specifically, and the presence of North Pacific Right Whale critical

habitat in the GOA. Participants frequently requested that the EIS/OEIS consider alternative technologies to mid-frequency active (MFA) sonar, while others stated that MFA and other forms of sonar are not required for training and should not be used within the GOA based upon "common knowledge" of the effects of sonar. Other commenters quoted previous EIS/OEIS's such as the Hawaii Range Complex Supplemental Draft EIS to state that the Navy, in this EIS, "…found that the use of MFA sonar and high-frequency active (HFA) sonar was harassment to a variety of whale species which included the endangered blue whale, fin whale, humpback and sperm, also Stellar Sea Lion." Several comments addressed protective and mitigation measures that are used now and that could be used for marine mammals when sonar is in use. Still, other comments voiced concern over the effects of all forms of sonar on migration patterns of whales, marine mammals, fish, and birds. A few comments expressed concern about potential negative impacts from sonar, both short- and long-term, to fish and the developing eggs/embryos of salmon and other commercial species (halibut, herring, haddock, pollock and crab). Other comments concerned sonar effects on the marine mammal food chain, including fish and zooplankton.

Several comments expressed general concern about Navy impacts, other than sonar, such as habitat quality and water quality, on marine life, while others identified specific policies that must be considered in the Navy's analysis, such as the Marine Mammal Protection Act, the Endangered Species Act, the Coastal Zone Management Act, the Magnuson-Stevens Fisheries Conservation Management Act, the Migratory Bird Treaty Act, and Executive Order 13158.

G.2.2.4 Biological Resources—Onshore

A few comments suggested that the EIS/OEIS should also evaluate impacts on plant species and habitats, and indirect impacts outside the defined project boundary. Several comments addressed the protection of birds, including shorebirds, seabirds and migratory birds. Potential stressors to birds mentioned in the comments included noise disturbance. Among other terrestrial issues were general concerns about impacts to Alaska's ecosystem and resources.

G.2.2.5 Cultural Resources

Participants commenting on cultural resources were primarily concerned with preserving the integrity of sport and subsistence activities to include native subsistence. A few comments also addressed the issue of pollution and potential damage to ancestral homelands.

G.2.2.6 Cumulative Impacts

Comments in this category expressed concern about the overall impact of past and present military activity in the GOA. One specific commenter asked "how the cumulative impact of noise from other sources (military, fisheries, ship traffic and other commercial and industrial sources) can be measured and monitored while the Navy sonar exercises are going on." Another commenter asked that the "…cumulative impacts on local communities, subsistence, endangered species, marine mammals, fish, birds, and the ecosystem, among others, to include the EXXON Valdez oil spill, be fully evaluated and presented to the public". Finally, one commenter noted that cumulative impacts should include the consideration of how Navy actions may impact climatic changes, given concerns about how climate change may already be stressing many species.

G.2.2.7 Environmental Justice

Commenters requested that the EIS/OEIS disclose what efforts were taken to meet environmental justice requirements consistent with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income/Populations. These commenters also requested information describing the methodology and criteria for identifying low-income and minority populations as well as sources and references used within the DEIS analysis. Comments were also made in reference to making a complete analysis of impacts, including cumulative impacts, to low-income and minority communities, as well as

methods of input for low-income populations and the means of outreach to these potentially affected communities.

G.2.2.8 Hazardous Materials/Hazardous Waste

Of the comments regarding hazardous materials and waste, the primary concerns articulated were over spills, specifically fuel oil, other toxic liquids, wastewater ballast and other bilge water discharges. Another area of concern was the effects of depleted uranium use in munitions on the environment in general. Other comments were in regard to chemical composition of the munitions that would be released. Additionally, a few individuals commented on World War II dump sites that are designated on some marine charts. These individuals want these areas to be re-identified, the types and quantities of materials and containers revealed to the public, and this information factored in to the DEIS analysis as previous military impacts on top of present and future proposed activities, as well as used to establish a baseline for cumulative impacts analysis.

G.2.2.9 Health and Safety

One comment expressed concern about safety implications to recreational swimmers and divers from mid-frequency active sonar.

G.2.2.10 Noise

Several commenters expressed concern about noise from ordnance, mid-frequency sonar, sonar jamming signals, low-frequency communication and surveillance sonar, mid- and high- frequency communication sonars and mechanical noises associated with warfare exercises, to include engine noises, explosions and munitions firing. Another commenter wanted to know what the seismic and sonic noise impacts will be to marine mammals, especially whales, walrus, and seals, and to fish and birds. Another commenter stated that the EIS should describe the impacts of noise on human and wildlife health and behavior, as well as the measures that will be employed to mitigate those impacts, such as physical controls, operations plans and flight corridors. Commenters stated that noise analysis methodologies should be explained and the single-event and cumulative noise metrics utilized in the analysis should be defined. One commenter was concerned about air or noise pollution in ancestral homelands – on or off shore.

G.2.2.11 Miscellaneous

Several comments were received that stated that the Navy was, in effect, moving to Alaska to conduct training, specifically sonar training, because "Court orders and lawsuits ran the Navy out of both California and Hawaii for similar tests and now you are making (a) move on our Alaskan waters." One commenter wanted to inform the Navy of vital telecommunication cables on the seafloor and indicated that Navy activities must be conducted away from these cables.

G.2.2.12 Mitigation Measures

Most comments regarding mitigation measures focused on marine mammals. For example, several comments expressed concern that spotting marine mammals is extremely difficult for even expert observers, and those commenters doubted that shipboard lookouts could detect animals in adverse sea conditions and especially at night. One commenter proposed that the Navy should use infrared imaging devices at night. Other commenters expressed concern about the effectiveness of the Navy's training program for spotting animals. One commenter believed that it would be impossible to avoid encounters with whales and other marine animals no matter how many lookouts the Navy utilizes or what time of the year training is conducted. Others questioned how the Navy is going to mitigate sonar's possible adverse impacts on marine mammals. Additionally, others asked that the Navy aggressively consider ways to expand, improve, and employ better protective measures in future sonar exercises, such as conducting more monitoring and enforcing larger safety zones around ships. Finally, comments were made that the Navy needs to better identify clear monitoring goals and objectives with specific parameters for

measuring success and provide a feedback mechanism for the public to view information on mitigation effectiveness and monitoring results.

G.2.2.13 Meetings/National Environmental Policy Act Process

Comments on the National Environmental Policy Act (NEPA) process included several that felt the information available during the scoping process was inadequate to provide informed comments or that the "poster" session was not the best format. Other commenters desired a more open forum type format, where all questions voiced could be heard by all. One commenter was disappointed that the Navy chose to hold scoping sessions in only three Alaska communities. Another requested that an additional scoping meeting be held in Homer, Alaska. Still other commenters desired the Navy to shift its meetings to later in the year (August), when there is less activity in the various fisheries.

G.2.2.14 Recreation

One comment expressed concern about preserving the integrity of commercial, sport and subsistence activities, including fishing and traditional harvesting of animals. Another comment concerned the possibility of being subjected to sonar while diving. Still others mentioned whale watching activities and how Navy activities might affect them.

G.2.2.15 Socioeconomics

Comments regarding socioeconomic concerns included questions about the effects and impacts on commercial fishing, tourism, and the economy in general.

G.2.2.16 Sonar and Underwater Detonations

Many comments mentioned concerns about the effect of Navy sonar on marine life, such as marine mammals, fish, sea turtles, and invertebrates. Others mentioned recent reports that fish suffer from hearing loss and widespread disorientation following loud noise intrusions and that catch rates of commercial species of fish have plummeted in the vicinity of noise sources. Some specific references to additional studies were received via comments. Others said that noise has been shown in several cases to kill, disable or disrupt the behavior of invertebrates and that little is known about the effects of MFAS on lower marine trophic levels such as phytoplankton and zooplankton. Participants frequently requested that the EIS/OEIS consider alternative technologies to sonar. Many felt that sonar activity is not necessary or appropriate for Alaska waters and that training could be accomplished through simulation and/or use of alternate technologies. Several comments addressed protective and mitigation measures for marine mammals when sonar is used. A few comments specifically mentioned concerns about possible acute and/or chronic effects on benthic and pelagic marine life from munitions discharges and explosions. Some commenters also discussed that analysis of possible impacts to the seafloor from expended materials during training exercises would need to be discussed.

G.2.2.17 Water Resources

Comments regarding water resources included general concerns about the potential effects on quality of both fresh and marine waters, not only in the designated training areas, but also in the land-based areas utilized for logistical support of the exercises, and areas adjacent to the training areas to be affected by military activities. Of specific concern were graywater (waste water from sinks, baths, showers, laundry, etc) and blackwater (waste water from human body wastes) that will be discharged from all vessels engaged in Northern Edge exercises, to include ballast water drawn from areas that may contain invasive species. A few of these comments quoted specific provisions of the Clean Water Act.

G.2.2.18 Summary of Comments

Table G-1 provides a breakdown of areas of concern based on comments received during scoping. Because most commenters provided comments on several issues, and because some commenters chose to

comment via multiple means, with only slight variations in their comments, the total count well exceeds the total number of 77 comments received.

Table G-1: Breakdown of Scoping Comments by Resource Area

Resource Area	Count	Percent of Total
Biological Resources - Marine Mammals	88	19.04%
Sonar and Underwater Detonations	74	16.01%
Biological Resources - Fish & Marine Habitat	45	9.74%
Mitigation	36	7.79%
Policy/NEPA	31	6.70%
Threatened and Endangered Species	30	6.49%
Commercial Fishing	27	5.84%
Alternatives	26	5.62%
Hazardous Materials / Hazardous Waste	24	5.19%
Socioeconomics	15	3.24%
Cumulative Impacts	11	2.38%
Water Resources	10	2.16%
Air Quality	8	1.73%
Biological Resources - Onshore	7	1.51%
Noise	6	1.29%
Miscellaneous	6	1.29%
Cultural Resources	5	1.08%
Proposed Action	5	1.08%
Coastal Zone Management Act	3	0.64%
Recreation	2	0.43%
Health and Safety	2	0.43%
Environmental Justice	1	0.21%
TOTAL	462	

G.3 PUBLIC REVIEW OF THE DRAFT EIS/OEIS

G.3.1 Federal Register Notice

On December 11, 2009, a Notice of Availability of the Draft EIS/OEIS was published in the *Federal Register*. This notice announced the availability of the Draft EIS/OEIS for public review. A news release was also issued and two media briefings were conducted to inform the public of the impending Notice publication. The Notice of Availability was the start of the public comment period for the Draft EIS/OEIS. The 45 day public comment period ended on January 25, 2010.

G.3.2 Public Notification

The Navy made significant efforts at notifying the public to ensure maximum public participation during the public hearing process. The public could submit comments in five ways:

- Oral statements at the public meetings (as recorded by the tape recorder);

- Written comments at the public meetings;
- Written letters (received any time during the public comment period);
- Electronic mail (received any time during the public comment period); and
- Comments submitted directly on the project website (received any time during the public comment period).

A summary of the Navy's public notification efforts follows.

G.3.2.1 Project Website

The Navy provided a public website that has been active since the NOI was published in March 2008. On the day of the public release of the Draft EIS/OEIS, this website made available an electronic (PDF) version of the Draft EIS/OEIS for download and review. A comment form could be downloaded from the website to allow the public to submit written comments. The website also provided a paperless capability for members of the public to enter a comment directly.

G.3.2.2 Newspaper Display Advertisements

Advertisements were made to announce the availability of the Draft EIS/OEIS and to announce the schedule and locations for public hearings as follows:

Anchorage Daily News
Monday, 14th December 2009
Tuesday, 15th December 2009
Wednesday, 16th December 2009
Monday, 28th December 2009
Wednesday, 6th January 2010
Thursday, 7th January 2010
Friday, 8th January 2010
Sunday, 10th January 2010
Monday, 11th January 2010

Peninsula Clarion
Monday, 14th December 2009
Tuesday, 15th December 2009
Wednesday, 16th December 2009
Monday, 28th December 2009
Wednesday, 30th December 2009
Wednesday, 6th January 2010
Thursday, 7th January 2010
Friday, 8th January 2010

Kodiak Daily Mirror
Monday, 14th December 2009
Tuesday, 15th December 2009
Wednesday, 16th December 2009
Monday, 28th December 2009
Tuesday, 5th January 2010
Wednesday, 6th January 2010
Thursday, 7th January 2010

Juneau Empire
Monday, 14th December 2009
Monday, 28th December 2009
Friday, 8th January 2010
Sunday, 10th January 2010
Monday, 11th January 2010
Cordova Times(Thursday only)
Thursday, 17th December 2009
Thursday, 24th December 2009
Thursday, 31th December 2009
Thursday, 7th January 2010

G.3.2.3 News Releases

Two news releases were distributed by the Commander, Navy Region Northwest Environmental Public Affairs Officer (CNRNW EPAO) to media outlets, elected officials and other potentially interested parties. The first news release was distributed on 11 December 2009, and announced the availability of the Draft EIS/OEIS. This news release included details on the Proposed Action, public hearings dates, locations, times and comment information.

A second news release was distributed by the CNRNW EPAO on 31 December 2009, and announced the Navy's upcoming public hearings. This news release, meant to encourage the public to attend the open

houses and presentation/oral comment sessions, provided detailed information on the location, dates, and times of the public hearings, in addition to comment information and details on the Proposed Action.

G.3.2.4 Public Service Announcement (PSA)

A PSA was distributed twice by CNRNW EPAO (31 December 2009, and 4 January 2010), announcing the public hearing locations, dates, time, close of comment period, and project Web site.

G.3.2.5 Postcard Mailers

Postcards announcing the availability of the Draft EIS/OEIS, comment information, and the public hearing dates, times, and locations were sent out to 691 individuals on the project mailing list on 23 December 2009.

G.3.2.6 Fliers

Fliers announcing the public open houses and presentation/oral comment sessions for each of the five public hearings locations were distributed to 45 locations.

G.3.2.7 Stake Holder Letters

DEIS Distribution/Public Hearings Letters were distributed 11 December 2009 and included the notification of public hearings and notice of availability of Draft EIS/OEIS (CD or hard copy of EIS included).

Following is a list of public officials, government agencies, Native American Tribes and Nations, organizations, and individuals who attended the public scoping meetings, provided comments during the scoping process, or have been identified by the Navy to be on the distribution list for the Gulf of Alaska Navy Training Activities Draft EIS/OEIS.

Federal and state regulatory agencies and project information repositories (noted below with an asterisk*) received both one (1) hard copy version and one (1) CD-ROM version of the Gulf of Alaska Navy Training Activities Draft EIS/OEIS. Stakeholders who specifically requested a hard copy version also received one, along with a CD-ROM version. All other stakeholders received one (1) CD-ROM version. Additional hard copies and/or CD-ROM versions of the Draft EIS/OEIS were made available when requested.

Information Repositories*

Loussac Library, Anchorage, AK

Alaska State Library, Juneau, AK

A. Holmes Johnson Memorial Library, Kodiak, AK

University of Alaska Fairbanks, Rasmussen Library, Fairbanks, AK

Cordova Public Library, Cordova, AK

Copper Valley Community Library, Glennallen, AK

Seward Community Library, Seward, AK

Humboldt Homer Public Library, Homer, AK

Federal Regulatory Agencies

Federal Aviation Administration
- Washington D.C. headquarters
- Alaska Region
- Navy Liaison Officer*

Marine Mammal Commission*

National Oceanic and Atmospheric Administration

National Marine Fisheries Service
- Washington D.C. headquarters*
- Alaska Region*
- Office of Protected Resources
- Habitat Conservation Division
- Alaska Fisheries Science Center

North Pacific Fisheries Management Council*

U.S. Army Corps of Engineers
- Alaska District

U.S. Department of the Air Force*

U.S. Department of the Army
-Environmental Resources Division*

U.S. Coast Guard
- Headquarters Office of Operating and Environmental Standards*
- District 17

U.S. Department of the Interior
- Bureau of Indian Affairs
- Bureau of Land Management
- Environmental Policy & Compliance Department*
- Minerals Management Service, Alaska Outer Continental Shelf Region*
- National Park Service, Glacier Bay*
- U.S. Fish & Wildlife Service, Alaska Region*
- U.S. Geological Survey, Alaska Science Center and Western Fisheries Research Center*

U.S. Environmental Protection Agency
- Washington D.C. headquarters*
- Region X*

U.S. Fish and Wildlife Service

U.S. Department of Agriculture
-U.S. Forest Service, Alaska Region

U.S. Department of Commerce

State Regulatory Agencies

Alaska Department of Fish and Game

Alaska Department of Natural Resources

Alaska Department of Commerce and Economic Development

Alaska Department of Environmental Conservation

Alaska Department of Transportation & Public Facilities

Alaska Office of History and Archaeology

Regulatory Commission of Alaska

Alaska Department of Military and Veterans Affairs

Native American Tribes and Nations*

Kaguyak Village

Lesnoi Village

Native Village of Afognak

Native Village of Chenega

Native Village of Eyak

Native Village of Old Harbor

Native Village of Ouzinkie

Native Village of Port Graham

Native Village of Port Lions

Native Village of Tatitlek

Shoonaq Tribe of Kodiak

Yakutat Tlingit Tribe

Federal Elected Officials

U.S. Representative
Hon. Donald Young, AK

U.S. Senator
Hon. Lisa Murkowski, AK

U.S. Senator
Hon. Mark Begich, AK

State Elected Officials

Governor of Alaska
Hon. Sean Parnell

Alaska State Senator
Hon. Bert Stedman
AK District A

Alaska State Senator
Hon. Dennis Egan
AK District B

Alaska State Senator
Hon. Albert Kookesh
AK District C

Alaska State Senator
Hon. Joe Thomas
AK District D

Alaska State Senator
Hon. Joe Paskvan
AK District E

Alaska State Senator
Hon. Gene Therriault
AK District F

Alaska State Senator
Hon. Linda Menard
AK District G

Alaska State Senator
Hon. Charlie Huggins
AK District H

Alaska State Senator
Hon. Fred Dyson
AK District I

Alaska State Senator
Hon. Bill Wielechowski
AK District J

Alaska State Senator
Hon. Bettye Davis
AK District K

Alaska State Senator
Hon. Johnny Ellis
AK District L

Alaska State Senator
Hon. Hollis French,
AK District M

Alaska State Senator
Hon. Lesil McGuire
AK District N

Alaska State Senator
Hon. Kevin Meyer
AK District O

Alaska State Senator
Hon. Con Bunde
AK District P

Alaska State Senator
Hon. Thomas Wagoner
AK District Q

Alaska State Senator
Hon. Gary Stevens
AK District R

Alaska State Senator
Hon. Lyman Hoffman
AK District S

Alaska State Senator
Hon. Donald Olson
AK District T

Alaska State Representative
Hon. Kyle Johansen
AK District 1

Alaska State Representative
Hon. Peggy Wilson
AK District 2

Alaska State Representative
Hon. Beth Kerttula
AK District 3

Alaska State Representative
Hon. Cathy Munoz
AK District 4

Alaska State Representative
Hon. Bill Thomas, Jr.
AK District 5

Alaska State Representative
Hon. Woodie Salmon
AK District 6

Alaska State Representative
Hon. Mike Kelly
AK District 7

Alaska State Representative
Hon. David Guttenberg
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Alaska State Representative
Hon. Bill Stoltze
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Alaska State Representative
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AK District 17

Alaska State Representative
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AK District 18

Alaska State Representative
Hon. Pete Peterson
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Alaska State Representative
Hon. Max Gruenberg
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Hon. Lindsey Holmes
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Hon. Bob Buch
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Alaska State Representative
Hon. Craig Johnson
AK District 28

Alaska State Representative
Hon. Chris Tuck
AK District 29

Alaska State Representative
Hon. Charisse Millet
AK District 30

Alaska State Representative
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Hon. Mike Hawker
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Alaska State Representative
Hon. Kurt Olson
AK District 33

Alaska State Representative
Hon. Mike Chenault
AK District 34

Alaska State Representative
Hon. Paul Seaton
AK District 35

Alaska State Representative
Hon. Alan Austerman
AK District 36

Alaska State Representative
Hon. Bryce Edgmon
AK District 37

Alaska State Representative
Hon. Bob Herron
AK District 38

Alaska State Representative
Hon. Richard Foster
AK District 39

Alaska State Representative
Hon. Reggie Joule
AK District 40

Local Elected Officials

Fairbanks North Star Borough
Hon. Luke Hopkins
Mayor

Kenai Peninsula Borough
Hon. David R. Carey
Mayor

Kodiak Island Borough
Hon. Jerome M. Selby
Mayor

Matanuska-Susitna Borough
Hon. Talis Colberg
Mayor

Municipality of Anchorage
Hon. Dan Sullivan
Mayor

City of Cordova
Hon. Timothy L. Joyce
Mayor

City/Borough of Juneau
Hon. Bruce Botelho
Mayor

Individuals

Tom Anderson
Cordova, AK

Claudia Anderson
Kodiak, AK

Brad Barr
Kodiak, AK

Wendy Beck
Kodiak, AK

Robert Berceli
Cordova, AK

Allison Bidlack
Cordova, AK

Cheryl Boehlan
Kodiak, AK

Richard Brenner
Cordova, AK

Bruce Cain
Cordova, AK

Mark Cammrys
Cordova, AK

Madelene Caselli
Palmer, AK

Al Clayton
Anchorage, AK

Taral Clayton
Anchorage, AK

Trevor Clayton
Anchorage, AK

Mark Cummings
Cordova, AK

Terry Cummings
Anchorage, AK

Dean Cwrzah
Kodiak, AK

Tess Dietrich
Kodiak, AK

Don Dunn
Kodiak, AK

James Fisher
Soldotna, AK

Robert Fisher
Kingwood, TX

Susan Glinton
Nassau, Bahamas

Lavonne Heacock
Rhododendron, OR

Pat Heitman
Kodiak, AK

Carolyn Heitman*
Kodiak, AK

Leona Heitsch
Bourbon, MI

Pat Holmes
Kodiak, AK

Deb Jaros
Kodiak, AK

Joanna Kappele
Chicago, IL

Lee Keller
Seward, AK

Kimberly Kopanuk
Anchorage, AK

Robert Kopchak
Cordova, AK

Aldone Kowenta
Kodiak, AK

Kurt Krieter
Palmer, AK

Alexis Kwachka
Kodiak, AK

Dave Lacey
Fairbanks, AK

Ann Mallard
Fairbanks, AK

Craig Matkin
Homer, AK

Irene Miramontes
Nassau, Bahamas

Maria Nasif
Tuscon, AZ

Susan Payne
Kodiak, AK

Geneneiva Pearson
Kodiak, AK

Susan Peehl
Cold Springs, NY

Barbara Sachau Florham Park, NJ	Joan Stempniak Homer, AK	Hans Tscherich Cordova, AK
Mike Sirofchruk Kodiak, AK	Dany Stihl Kodiak, AK	Keith Van den Broek Cordova, AK
Ralph Sirofchruk Kodiak, AK	Delores Stokes Kodiak, AK	Barbara Volpe Kodiak, AK
Michael Sirofchuck Kodiak, AK	John F. Thomas Cordova, AK	Elise Wolf Fritz Creek, AK
Erin Starr-Hollow Kodiak, AK	Kip Thomet Kodiak, AK	

G.3.3 Public Hearings

During the public comment period the Navy held public hearings to present information from the EIS/OEIS and to solicit public comments. Public hearings were held on the following dates and locations in Alaska: 7 January 2010, Kodiak; 8 January 2010, Anchorage; 9 January 2010, Homer, Alaska; 11 January 2010, Juneau; 12 January 2010, Cordova. Staffed poster stations with detailed information about the project and the Draft EIS/OEIS results were open for each meeting from 5:00 to 7:00 PM. During this time, Navy experts were available to answer questions and receive comments from members of the public. At 7 PM during each meeting a more formal, structured public hearing began in which the Navy presented a briefing on the Draft EIS/OEIS and the study conclusions. Following that presentation, individuals provided oral comments. All oral comments were captured by a court reporter and have been reproduced later in this appendix. In addition to oral comments, the Navy received written comments during these hearings.

G.3.3.1 Public Hearing Comments

In total, the Navy received comments from 213 individuals or organizations. These comments included 140 comments via the website, 38 comments via mail, and 64 comments made in person during the public hearing meetings. Comments were further broken out into 1,127 comment issues to best respond to each concern of the individual or organization.

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Appendix H

Acoustic Systems Descriptions

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H ACOUSTIC SYSTEMS DESCRIPTIONS

H.1 GENERAL SUMMARY OF ACOUSTIC SYSTEMS

Various active acoustic sources that may or may not affect the local marine mammal population are deployed by platforms during various training activities, exercises and maintenance events. The following sections discuss the acoustic sources that could be present during such training activities, exercises, and maintenance events.

H.1.1 Surface Ship Sonars

- AN/SQS-53 – a computer-controlled, hull-mounted surface-ship sonar that has both active and passive operating capabilities, providing precise information for anti-submarine warfare (ASW) weapons control and guidance. The system is designed to perform direct-path ASW search, detection, localization, and tracking from a hull-mounted transducer array. The AN/SQS-53 (Figure H-1) is characterized as a mid-frequency active (MFA) sonar, operating from 1 to 10 kilohertz (kHz); however, the exact frequency is classified. The AN/SQS-53 sonar is the major component to the AN/SQQ-89 sonar suite, and it is installed on Arleigh Burke Class guided missile destroyers (DDGs), and Ticonderoga Class guided missile cruisers (CGs).



Figure H-1. Arleigh Burke Class DDG equipped with AN/SQS-53 (L); Ticonderoga Class CG showing AN/SQS-53 (R)

- AN/SQS-53 Kingfisher – a modification to the AN/SQS-53 sonar system that provides the surface ship with an object detection capability. The system uses MFA sonar, although the exact frequency range is classified. This sonar system is installed on Arleigh Burke Class DDGs, and Ticonderoga Class CGs.
- AN/SQS-56 – a hull-mounted sonar that features digital implementation, system control by a built-in mini computer, and an advanced display system. The sonar is an active/passive, preformed beam, digital sonar providing panoramic active echo ranging and passive digital multibeam steering (DIMUS) surveillance. The sonar system is characterized as MFA sonar, although the exact frequency range is classified. The AN/SQS-56 (Figure H-2) is the major component of the AN/SQQ-89 sonar suite and is installed on Oliver Hazard Perry Class frigates (FFGs).



Figure H-2. Oliver Hazard Perry Class FFG equipped with AN/SQS-56

- AN/SQR-19 – a tactical towed array sonar (TACTAS) that is able to passively detect adversary submarines at a very long range. The AN/SQR-19, which is a component of the AN/SQQ-89 sonar suite, is a series of passive hydrophones towed from a cable several thousand feet behind the ship. This sonar system is a passive sensing device; therefore, it is not analyzed in this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS). The AN/SQR-19 (Figure H-3) can be deployed by Arleigh Burke Class DDGs, Ticonderoga Class CGs, and Oliver Hazard Perry Class FFGs.

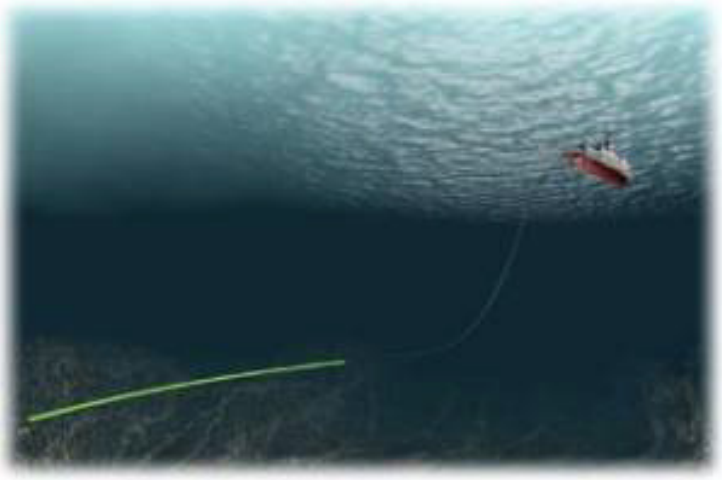


Figure H-3. AN/SQR-19

H.1.2 Surface Ship Fathometer

The surface ship fathometer (AN/UQN-4) is used to measure the depth of water from the ship's keel to the ocean floor for safe operational navigation. Fathometers are operated from all classes of United States (U.S.) Navy surface ships and are considered MFA sonar, although the exact frequency range is classified.

H.1.3 Submarine Sonars

- AN/BQQ-5 – a bow- and hull-mounted passive and active search and attack sonar system. The system includes the TB-16 and TB-23 or TB-29 towed arrays and Combat Control System (CCS) MK 2. This sonar system is characterized as MFA, although the exact frequency range is classified. The AN/BQQ-5 (Figure H-4) sonar system is installed on Los Angeles Class nuclear attack submarines (SSNs) and Ohio Class ballistic missile nuclear submarines (SSBNs), although the AN/BQQ-5 systems installed on Ohio Class SSBNs do not have an active sonar capability. The AN/BQQ-5 system is being phased out on all submarines in favor of the AN/BQQ-10 sonar. The operating parameters of both systems with regard to sound output in the ocean are almost identical. For these reasons, these systems will be referred to as AN/BQQ-10 in this EIS.



Figure H-4. AN/BQQ-5

- AN/BQQ-10 (also known as Advanced Rapid Commercial-Off-the-Shelf Insertion [ARCI]) – a four-phase program for transforming existing submarine sonar systems (i.e., AN/BQQ-5) from legacy systems to more capable and flexible active and passive systems with enhanced processing using commercial-off-the-shelf (COTS) components. The system is characterized as MFA, although the exact frequency range is classified. The AN/BQQ-10 (Figure H-5) is installed on Seawolf Class SSNs, Virginia Class SSNs, Los Angeles Class SSNs, and Ohio Class SSBN/nuclear guided missile submarines (SSGNs). The BQQ-10 systems installed on Ohio Class SSBNs do not have an active sonar capability.

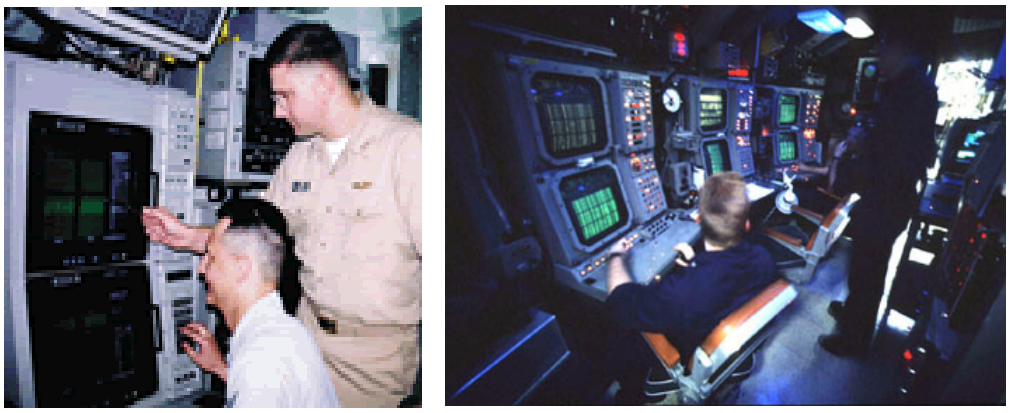


Figure H-5. Sailors operating AN/BQQ-10

H.1.4 Submarine Auxiliary Sonar Systems

- AN/BQS-15 – an under-ice navigation and mine-hunting sonar (Figure H-6) that uses both mid- and high-frequency (i.e., greater than 10 kHz) active sonar, although the exact frequencies are classified. Later versions of the AN/BQS-15 are also referred to as Submarine Active Detection Sonar (SADS). The Advanced Mine Detection System (AMDS) is being phased in on all ships and will eventually replace the AN/BQS-15 and SADS. These systems are installed on Seawolf Class SSNs, Virginia Class SSNs, Los Angeles Class SSNs, and Ohio Class SSGNs.

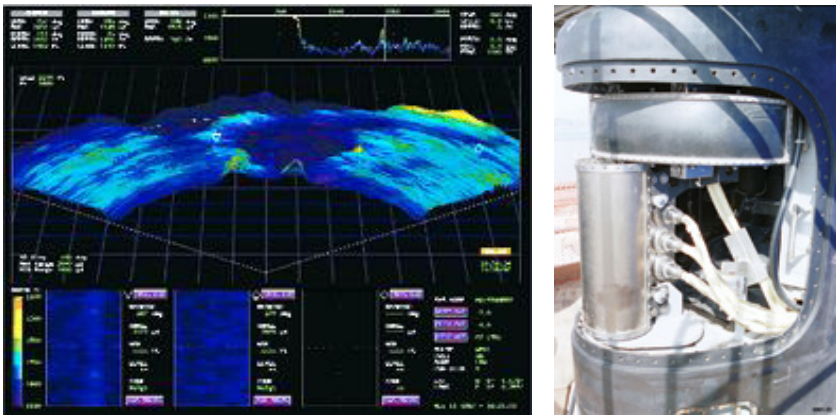


Figure H-6. AN/BQS-15 display (L), and sensor components (R)

- AN/WQC-25 – an MFA sonar underwater communications system that can transmit either voice or signal data in two bands, 1.5 to 3.1 kHz or 8.3 to 11.1 kHz. The AN/WQC-2 (Figure H-7), also referred to as the "underwater telephone" (UWT), is on all submarines and most surface ships, and allows voice and tonal communications between ships and submarines.



Figure H-7. AN/WQC-2 transducer (L), and control unit (R)

H.1.5 Aircraft Sonar Systems

Aircraft sonar systems that could be deployed during active sonar events include sonobuoys (tonal [active], listening [passive], and extended echo ranging [EER] or improved extended echo ranging [IEER]) and dipping sonar (AN/AQS-13/22 or AN/AOS-22). Sonobuoys may be deployed by Marine Patrol Aircraft (MPA) or MH-60R helicopters. A sonobuoy is an expendable device used by aircraft for the detection of underwater acoustic energy and for conducting vertical water column temperature measurements. Most sonobuoys are passive, but some can generate active acoustic signals as well as listen passively. Dipping sonars are used by MH-60R helicopters. Dipping sonar is an active or passive

sonar device lowered on cable by helicopters to detect or maintain contact with underwater targets. A description of various types of sonobuoys and dipping sonar is provided below.

- AN/AQS-13 Helicopter Dipping Sonar – an active scanning sonar that detects and maintains contact with underwater targets through a transducer lowered into the water from a hovering helicopter. It operates at mid-frequency, although the exact frequency is classified. The AN/AQS-13 (Figure H-8) is operated by MH-60R helicopters.



Figure H-8. AN/AQS-13 being deployed by a Navy helicopter

- AN/AQS-22 Airborne Low-Frequency Sonar (ALFS) – the U.S. Navy's dipping sonar system for the MH-60R helicopter Light Airborne Multi-Purpose System III (LAMPS III), which is deployed from aircraft carriers, cruisers, destroyers, and frigates. It operates at mid-frequency, although the exact frequency is classified. The AN/AQS-22 (Figure H-9) employs both deep- and shallow-water capabilities.



Figure H-9. AN/AQS-22 being deployed by a Navy helicopter

- AN/SSQ-62C Directional Command Activated Sonobuoy System (DICASS) – sonobuoy that operates under direct command from ASW fixed-wing aircraft or MH-60R helicopters (Figure H-10). The system can determine the range and bearing of the target relative to the sonobuoys position and can deploy to various depths within the water column. The active sonar operates at mid-frequency, although the exact frequency range is classified. After water entry, the sonobuoy transmits sonar pulses (continuous waveform [CW] or linear frequency modulation [LFM]) upon command from the aircraft. The echoes from the active sonar signal are processed in the buoy and transmitted to the receiving station onboard the launching aircraft.



Figure H-10. AN/SQS-62 (L); MPA equipped with AN/SQS-62 sonobuoys (R)

- AN/SSQ-110A Explosive Source Sonobuoy – a commandable, air-dropped, high source level explosive sonobuoy. The AN/SSQ-110A explosive source sonobuoy (Figure H-11) is composed of two sections, an active (explosive) section and a passive section. The upper section is called the "control buoy" and is similar to the upper electronics package of the AN/SSQ-62 DICASS sonobuoy. The lower section consists of two signal underwater sound (SUS) explosive payloads of Class A explosive weighing 1.9 kg (4.2 lbs) each. The arming and firing mechanism is hydrostatically armed and detonated. Once in the water, the SUS charges explode, creating a loud acoustic signal. The echoes from the explosive charge are then analyzed on the aircraft to determine a submarine's position. The AN/SSQ-110A explosive source sonobuoy is deployed by MPA.



Figure H-11. MPA deploying AN/SSQ-110A

- AN/SSQ-53D/E Directional Frequency Analysis and Recording (DIFAR) – a passive sonobuoy deployed by MPA aircraft and MH-60R helicopters. The DIFAR sonobuoy (Figure H-12) provides acoustic signature data and bearing of the target of interest to the monitoring unit(s) and can be used for search, detection, and classification. The buoy uses a hydrophone with directional detection capabilities in the very low frequency, low frequency, and mid-frequency ranges, as well as an omnidirectional hydrophone for general listening purposes.



Figure H-12. AN/SSQ-53 (L); AN/SSQ-53 being loaded onto MPA (R)

H.1.6 Torpedoes

Torpedoes are the primary ASW weapon used by surface ships, aircraft, and submarines. When torpedoes operate actively, they transmit an active acoustic signal to ensonify the target and use the received echoes for guidance.

- MK 48 and MK 48 Advanced Capability (ADCAP) (Figure H-13) are heavyweight torpedoes deployed on all classes of Navy submarines. MK 48 and MK 48 ADCAP torpedoes are inert and considered HF sonar, but the frequency ranges are classified. Due to the fact that both torpedoes are essentially identical in terms of environmental interaction, they will be referred to collectively as the MK48 in this EIS.



Figure H-13. MK 48/MK 48 ADCAP (L); Seawolf Class SSN launching MK-48/MK-48 ADCAP (R)

H.1.7 Exercise Training Targets

There are two types of training targets, the MK 30 Acoustic Target and the MK 39 Expendable Mobile ASW Training Target (EMATT) (Figure H-14). ASW training targets simulate submarines as an ASW target in the absence of participation by a submarine in an exercise. They are equipped with acoustic projectors emanating sounds to simulate submarine acoustic signatures, and echo repeaters to simulate the characteristics of the reflection of a sonar signal from a submarine.

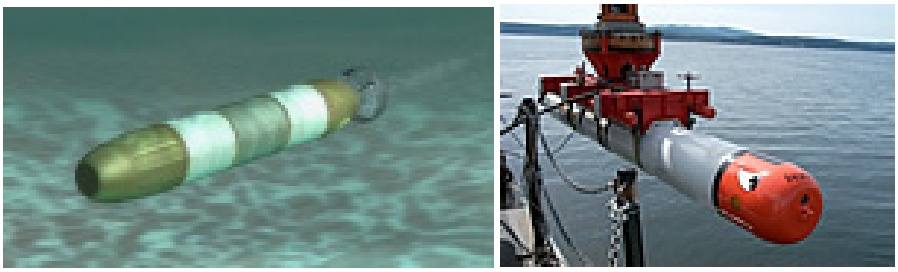


Figure H-14. MK 39 EMATT (L) and MK 30 (R)

In addition, surface targets such as "sleds" (aluminum catamarans), seaborne powered targets (radio-controlled high-speed boats), and target drone units (TDUs) could also be deployed during training exercises.

H.1.8 Tracking Pingers, Transponders, and Acoustical Communications (ACOMs)

Tracking pingers are installed on training platforms to track the position of underwater vehicles. The pingers generate a precise, preset, acoustic signal for each target to be tracked. ACOMs and transponders provide the communication link between sensor packages and base platform allowing information to be exchanged.

- MK 84 Pinger Signal, Underwater Sound (SUS) – an air or surface dropped noisemaking device (Figure H-15) that emits one of five mid-frequency tonal patterns using two MFA sonars with frequencies at 3.1 and 3.5 kHz; it is used to provide prearranged signal communications to submerged submarines.



Figure H-15. MK 84

H.1.9 Portable Undersea Training Range (PUTR)

The Portable Undersea Training Range (PUTR) is a self-contained, portable, undersea tracking capability that employs modern technologies to support coordinated USW training for Forward Deployed Naval Forces (FDNF). PUTR will be available in two variants to support both shallow and deep water remote operations in keeping with Navy requirements to exercise and evaluate weapons systems and crews in the environments that replicate the potential combat area.

PUTR-D, shown below in Figure H-16, consists of a set of transponders which will be deployed by a ship of opportunity and anchored to the ocean bottom. Once deployed a survey is conducted by a range vessel to determine the transponder locations and to test tracking accuracy. The transponder is activated by utilizing an acoustic command signal during operations and commanded into sleep mode when not in use. Operational lifetime, due to transponder battery life, will meet the key performance parameters, including the operating objective of actual tracking time. The transponders can remain deployed for up to 12 months in a dormant state. Transponders will be recovered for battery/buoy maintenance or for range recovery by transmitting an acoustic command which releases the transponder electronics/floatation buoy

package from the anchor. The ship of opportunity will then retrieve the transponders leaving the anchor *in-situ*.

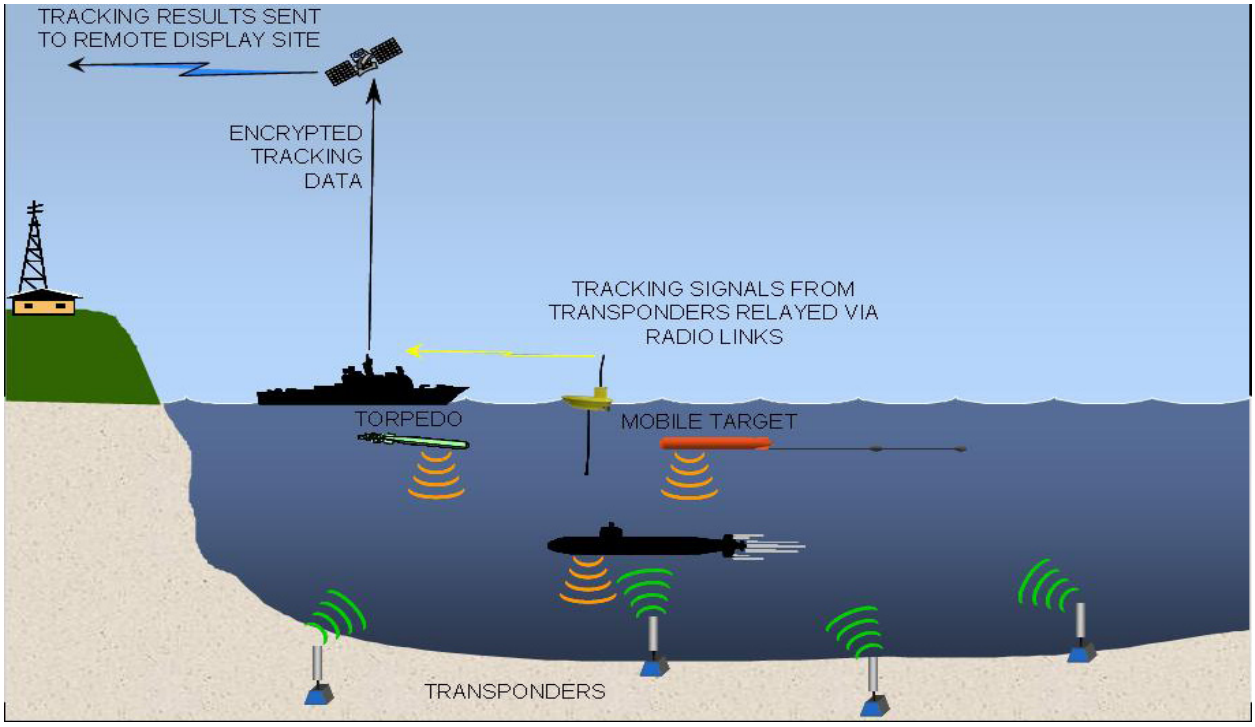


Figure H-16. Portable Undersea Training Range Deep (PUTR-D) Transponder Configuration

H.1.10 Advanced Extended Echo Ranging (AEER)

The Advance Extended Echo Ranging program examines improvements in both long-range shallow and deep water ASW search using active sources (Air Deployable Low Frequency Projector (ADLFP), Advance Ranging Source (ARS)) and passive sonobuoy receivers (Air Deployable Active Radar Receiver (ADAR)). The signal processing is provided by research conducted under Advanced Multi-static Processing Program (AMSP).

The AEER system is similar to the IEER system in that it uses the AN/SSQ-101 Air Deployed Active Receiver (ADAR) sonobuoy. But instead of the SSQ-110A Extended Echo Range Sonobuoy it is coupled with the SSQ-125 Air Deployable Coherent Source Sonobuoy. The SSQ-125 system is in the R&D stage with two types of sensor technology being considered (the ADLFP and ARS). The buoy is intended to provide the user with a sonobuoy with an improved bi-static acoustic source and better signal processing for harsh water environments. Table H-1 below is a comparison of the echo ranging systems.

Table H-1. Echo Ranging Systems

	Current System	Current System	Future System
Aircraft System =	EER	IEER	AEER
Buoys = (Source)	SSQ-110 (EER)	SSQ-110 (EER)	SSQ-125 (ADLFP)
Buoys = (Receiver)	SSQ-77 (VLAD)	SSQ-101 (ADAR)	SSQ-101 (ADAR)
Area of use =	Deep Water Only	Littoral &Deep Water	Enhanced Littoral & Deep Water
Used by	P-3C	P-3C (IOC)	P-3C/MH-60R

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Appendix I

Public Comments and Responses

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I PUBLIC COMMENTS

The Navy received public comments on the Draft Environmental Impact Statement / Overseas Environmental Impact Statement (EIS/OEIS) via three media; written comments, website comments, and oral comments. Regardless of the medium, all comments have been treated equally. The comments are from the public comment period for the document, December 11, 2009 through January 25, 2010.

Written comments were mailed directly to the Navy. Website comments were submitted to the Navy via the project website. Oral comments were taken directly from the official court reporter transcripts. To allow side-by-side review of the comments and the Navy responses, all comments have been converted to text and entered into a table format that follows, with the comment in one column and the Navy's response in the next column. The comments have been reproduced verbatim and accurately to the extent as possible. In some cases, the editors may have made minor errors in the translation of some handwritten letters. For this reason, a copy of each written comment has been placed at the end of Appendix I. Appendix I also contains the official court transcripts of one complete public hearing, and the oral comments made at each of the public hearings. Website comments were electronically submitted and copied directly into this Appendix, so no other reproduction was necessary.

In preparing the Gulf of Alaska (GOA) Navy Training Activities Draft EIS/OEIS, each resource section was prepared and reviewed by numerous qualified individuals, each specialists in their respective fields, to ensure that the resources and issues received a rigorous and thorough assessment. The best available scientific data and the latest peer-reviewed studies were considered.

In this Final EIS/OEIS, the Navy has made changes to the Draft EIS/OEIS, based on comments received during the public comment period. These changes include factual corrections, additions to existing information, and improvements or modifications to the analyses in the Draft EIS/OEIS. This section presents the public comments received and the Navy's responses to these comments. The changes made to the document based on comments do not result in any significant modifications to the proposed action, the alternatives considered, the affected environment or the environmental effects analyses of the Draft EIS/OEIS that would require further public participation.

Although all comments have been read and considered, some comments were not specific regarding the analyses or the alternatives in the Draft EIS/OEIS and, therefore, could not be given specific responses. As stated in the Council on Environmental Quality's (CEQ) Regulations for Implementing the National Environmental Policy Act (NEPA), 40 CFR Part 1503.3(a), "Comments on an environmental impact statement or on a proposed action shall be as specific as possible and may address either the adequacy of the statement or the merits of the alternatives discussed or both."

I.1 WRITTEN COMMENTS

The comments in this section were received in written form by organizations, agencies, tribes and individuals. The first part of the section is a copy of each of the individual comments received by the Navy. This is followed by a second section that has a consolidated table with comments in alphabetical order by commenter's name. If an organization or affiliation name was submitted, then the comment was listed under that name, not the individual.

I.1.1 ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

STATE OF ALASKA

DEPT. OF ENVIRONMENTAL CONSERVATION
DIVISION OF SPILL PREVENTION AND RESPONSE
INDUSTRY PREPAREDNESS PROGRAM
Marine Vessels Section

SEAN PARNELL, GOVERNOR

555 Cordova Street
Anchorage, AK 99501
PHONE: (907) 269-3094
FAX: (907) 269-7687
http://www.dec.state.ak.us

January 6, 2010

File No. 207.50 (USN)

Commander
United States Pacific Fleet
250 Makalapa Drive
Pearl Harbor, HI 96860-3131

Attention: D.A. McNair

Subject: **Department of the Navy letter 50590, Ser N01CE1/1333 dated, December 4, 2009**

Dear Mr. McNair:

The Alaska Department of Environmental Conservation has reviewed the information in the subject letter and the referenced websites regarding United States Navy training intentions within the described temporary Maritime Exercise Area in the Gulf of Alaska. It has been determined that the temporary Maritime Training Area is not within Alaska State waters. Therefore, there is no regulatory jurisdiction within the proposed training area under the provisions of Title 18, Alaska Administrative Code, Chapter 75, Oil and Other Hazardous Substances Pollution Control.

Thank you for inquiry with the Alaska Department of Environmental Conservation. If you have any questions regarding this correspondence please contact Martin Farris at (907) 269 8487 or martin.farris@alaska.gov or John Kotula at (907) 835 3037 or john.kotula@laska.gov.

Sincerely,

Betty Schorr
Program Manager

Electronic cc:
John Kotula, ADEC
Larry Dietrick, ADEC
Martin Farris, ADEC

cc:
Project file

Printed on Recycled Paper

I.1.2 ALASKA DEPARTMENT OF MILITARY AND VETERAN AFFAIRS

STATE OF ALASKA

DEPARTMENT OF MILITARY AND VETERANS AFFAIRS

OFFICE OF THE COMMISSIONER

Sean Parnell, GOVERNOR

P. O. BOX 5800
Ft Richardson, ALASKA 99505-5800
PHONE: (907) 428-6003
FAX: (907) 428-6019

January 20, 2010

Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt – Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Dear Mrs. Burt:

As the Commissioner of Alaska's Department of Military and Veterans Affairs, I can assure you that the Parnell Administration fully supports "Alternative 2" proposed by the U. S. Navy in its Draft "Gulf of Alaska Navy Training Activities Environmental Impact Statement / Overseas Environmental Impact Statement" (EIS/OEIS) This Administration supports the "increase training activities to include the use of active sonar, accommodate force structure changes to include new platforms, weapon systems, and training enhancement instrumentation, and conduct one additional summertime CSG exercise annually."[1] The Parnell Administration's support of Alternative 2 is steadfast given that the U.S. Navy has an excellent track record in caring for Alaska's land, sea, and air.

As you realize, the Gulf of Alaska is very important to the people of our state who rely on this area for their livelihood and subsistence needs. These areas are home to a vast array of marine mammals and the largest and most diverse fisheries in the United States. We understand that protecting the marine environment of the Gulf of Alaska is an important goal for the Navy. We appreciate the Navy following detailed programs to care for the environment and realize that the Navy continues to improve these programs as they learn more about the ocean and marine species. We also clearly understand and support the purpose of the Navy's Proposed Action is to achieve and maintain Fleet readiness using the Alaska Training Areas to support and conduct current, emerging, and future training activities. The air, land, and sea spaces of the Alaska Training Areas have and continue to provide a realistic training environment for the men and women in uniform. The State of Alaska supports this training as it provides for defense of the nation and our state. In many ways Alaska has been historically on the front lines and has provided a position of importance in strategic defense plans of our nation.

[1] GULF OF ALASKA NAVY TRAINING ACTIVITIES DRAFT EIS/OEIS DECEMBER 2009

The State of Alaska supports the Proposed Action and is confident the Navy is committed to the protection of our maritime and other natural resources. Analysis of the proposed action indicates there is no risk to public safety, human health, or the environment. Alaska has considerable experience working cooperatively with the Navy and this history shows us that the Navy is responsive to the concerns of Alaska.

Sincerely,



Brigadier General Thomas H. Katkus
Commissioner

I.1.3 ALASKA MARINE CONSERVATION COUNCIL

Alaska Marine Conservation Council

Submitted by mail

Amy Burt
Gulf of Alaska EIS/OIES Project Manager
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101
Tel.: (360) 396-0924

January 25, 2010

Re: *Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities*

The Alaska Marine Conservation Council (AMCC) is a community-based organization dedicated to protecting the integrity of Alaska's marine ecosystems. Please accept these comments on behalf of our board and members who include commercial and sport fishermen, subsistence harvesters, and coastal residents throughout Alaska. These individuals and their families are culturally and economically dependent on a healthy marine and coastal environment.

AMCC submits these comments in addition to verbal testimony provided at the hearing on the Draft EIS in Kodiak, Alaska on January 7, 2010.

After review of the Draft EIS, AMCC remains concerned about the proposed increase in Navy training activities in the Gulf of Alaska (GOA). Particularly of concern are the effects of underwater noise on living marine resources, especially noise resulting from the use of sonar in this productive and important marine environment.

AMCC supports the no action alternative which would maintain current training activities and does not involve the use of sonar. The alternatives listed in the analysis are inadequate to explore a range of options for increased training potential without the use of sonar, and thereby reduce options for consideration only to the no action alternative.

Overall, the proposed action would result in dramatic changes in the acoustic marine environment inside and adjacent to the operating area that could have significant impacts on fish and marine mammals inhabiting these waters.

Designated critical habitat for the North Pacific right whale, the world's most endangered whale, is located directly adjacent to the training area, a mere 12 miles away. This is a major concern given that this population is literally teetering on the brink of extinction. Waters in the Gulf of Alaska provide vital feeding habitat particularly suited to the right whale's biological needs. Underwater noise related to the proposed Navy training activities could drive the right whales away from these feeding grounds, potentially resulting in major impacts to the North Pacific right whale population and species.

In response to measures to mitigate impacts on marine mammals with use of on board visual monitors in the form of personnel with binoculars as the primary means to reduce impact, we

healthy oceans ... healthy communities | PO Box 101145 Anchorage, AK 99510 www.akmarine.org
tel 907.277.5357 *fax* 907.277.5975 *email* amcc@akmarine.org

believe these measures to be inadequate. The proposed measures rely on observations to enact the 1,000 yard power down and the 200 yard shut down.

Fishermen can share endless stories about looking for gear in this area. Boats can spend hours and even days searching for a flag and buoy they know is there, with the benefit of locating coordinates, before spotting the gear. Studies show that visual monitoring only spots about 5% of marine mammals.

In addition, it is quite possible the Navy underestimates the number of marine mammals and fish that may be harassed, injured or killed due to lack of density estimates needed to accurately make this determination. For many reasons, there a simply no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in this region.

Another factor that has not been considered in the EIS is the habituation of sperm whales with commercial fishing vessels. In recent years, interactions between commercial fishing vessels prosecuting the halibut and sablefish fisheries have had increased interactions with sperm whales as the whale approach the boats looking for an easy meal. A whale may seek out the sound of a boat to explore the vessel's activity, thereby further decreasing the effectiveness of proposed mitigation measures and increasing the whale's exposure to noise resulting from training activities.

The Draft EIS is majorly lacking in a robust analysis of fish habitat and fishing grounds that occur in the geographic area considered for training activities, which precludes any effective analysis of the potential impacts to fish and commercial fishing activities from the proposed activities. For example, the Draft EIS does not include an adequate discussion of salmon migratory routes in the Gulf of Alaska and therefore lacks a robust analysis of impacts to migrating salmon species in the region.

The Draft EIS is lacking a thorough analysis of the potential impacts to halibut and the halibut fishery. **The document includes no discussion or maps showing the major halibut regulatory area that directly overlaps the training area nor does it discuss halibut habitat in the area- this information must be added to the Draft EIS.**

The proposed training activities area overlaps Gulf of Alaska Slope Habitat Conservation Areas that are not mentioned in the Draft EIS (see: http://www.fakr.noaa.gov/habitat/efh/goashca.pdf). The Draft EIS should include maps showing the overlap of designated EFH and other important fish habitat in the Gulf of Alaska such as the Slope Habitat Conservation Areas.

Additionally, while the Draft EIS admits that "…the effects of sound on fish are largely unknown" (3.6-4.3), it concludes that the proposed activities including sonar will not adversely affect fish. AMCC advises the Navy to utilize a precautionary approach to potential impacts in data poor environments, especially when dealing with highly valuable commercial fish stocks or endangered marine mammals populations.

The Draft EIS also lacks a thorough assessment of the overlap with fishing areas, and the conclusion that there will be no socioeconomic impacts from the proposed action (including fishing) is impossible to predict without comprehensive answers to the above mentioned comments.

In addition to concerns regarding effects on marine mammals and fish as a result of the use of sonar and an increase in underwater noise from training activities, AMCC is also

Alaska Marine Conservation Council

concerned about expended, hazardous wastes expected to result from the proposed training activities. The Navy concludes in the Draft EIS, without sufficient data, that, "In general, ordnance constituents appear to pose little risk to the marine environment (3.2-5). Again, there is no specific analysis of the benthic communities where these expended materials settle, and they may include EFH as well as Habitat Areas of Particular Concern (HAPCs), or important habitat for bottom-dwelling halibut.

AMCC is dismayed that the Navy only provided the bare minimum 45-day review for the Draft EIS and did so over the holidays, leaving insufficient time for the public to review and comment on the proposed action. This lack of consideration for the public's ability to comment is unacceptable given the scope of the proposed activities. AMCC requested an extension of the Draft EIS comment period and we do so again here in our written comments.

Furthermore, new research points to the disturbing trend of ocean acidification occurring in our marine waters, with high latitude seas particularly at risk. Reduced pH levels already measured in the Gulf of Alaska pose a new and potentially significant source of stress on the food web (J. Mathis. 8/11/09. Ocean Acidification in Alaska: New findings show increased ocean acidification in Alaska waters. University of Alaska Fairbanks, School of Fisheries and Ocean Sciences. Press release. http://www.sfos.uaf.edu/oa/). Alarmingly, studies have also demonstrated that noise travels farther underwater as pH reduces, creating concern for acoustic changes in the marine environment to have an even greater impact on marine species that previously thought. (Hester, et al. 2008. Unanticipated consequences of ocean acidification: A noisier ocean at lower pH. Geophysical Research Letters. Vol. 35. http://iod.ucsd.edu/courses/sio278/documents/hester_et_al_08_ocean_noisier_pH_jrl.pdf). The Navy must consider this research and the impacts of ocean acidification on the marine environment in the EIS, especially within the cumulative impacts section.

In closing, we again urge the selection of the No Action Alternative. The proposed increase in Naval training activities in the Gulf of Alaska lies squarely within some of the most productive marine waters in the United States and the world. The Gulf is home to a myriad of marine mammals, fish and other marine species that contribute to a rich and productive tapestry of life here. Important fish habitat and fishing grounds overlaps and lies adjacent to the area proposed for training, and coastal communities rimming the Gulf of Alaska continue to rely on the health of these fisheries for their economic and cultural well-being.

Given the high stakes to the living marine resources and surrounding communities, we strongly reiterate that this is an inappropriate location for increasing Naval training exercises and introducing the use of sonar.

Sincerely,

Theresa Peterson
Kodiak Outreach Coordinator
Alaska Marine Conservation Council

Kelly Harrell
Executive Director
Alaska Marine Conservation Council

healthy oceans ... healthy communities

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tel 907.277.5357 *fax* 907.277.5975 *email* amcc@akmarine.org

I.1.4 ANDREW BAKKE

United States Navy

Public Hearing Comment Form

Gulf of Alaska Navy Training Activities
Draft Environmental Impact Statement/
Overseas Environmental Impact Statement

Please record your comments on this form to let the U.S. Navy know what concerns and comments you have on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). You may submit your comments by:

1) Depositing this form at the Comment Table before you leave tonight.
2) Submitting your comments via the project Web site at **www.GulfofAlaskaNavyEIS.com**
3) Mailing this form to:
Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt – Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

☐ *Please check the box if you would like to receive a CD copy of the Final EIS/OEIS. Provide your mailing address below.*

All comments must be received or postmarked no later than January 25, 2010, to be considered in the Final EIS/OEIS.

Name: ANDREW N. BAKKE

Organization/Affiliation:

Address:* Box 3162

City, State, Zip Code: HOMER AK. 99603

Comments: I am complety against this unnessary program !!!

Andrew N. Bakke

Visit www.GulfofAlaskaNavyEIS.com for project information.

I.1.5 BASEL ACTION NETWORK (BAN)

From: Colby Self
To: Burt, Amy E CIV NAVFAC NW, EV1
Subject: GOA Draft EIS - Comment
Date: Monday, May 10, 2010 21:04:18

Ms. Amy Burt,

I write on behalf of the Basel Action Network (BAN) to submit comment on the Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for proposed Gulf of Alaska (GOA) training exercises. BAN requests consideration of the comments because they present new information that was not previously available during the comment period.

While the comment period for the draft EIS has closed, the comments provided in the attachment contain new information showing that the proposed GOA training exercises will affect the quality of the environment in a significant manner not addressed under the draft EIS. Therefore, BAN requests consideration of this new information in the final EIS or through a supplemental EIS. See 40 C.F.R. §1502.9(c)(1)(ii); Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 374 (1989).

Please find comment attached. Your acknowledgment of receipt of this e-mail and its attached comment are much appreciated.

Sincerely,

Colby Self
Basel Action Network
206.250.5652

basel action network

turn back the toxic tide

122 S. Jackson St., Suite 320
Seattle, Washington 98104
Telephone 206 652-5555 Web: www.ban.org

Mrs. Amy Burt
Gulf of Alaska EIS/OEIS Project Manager
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

May 10, 2010

RE: Comment on Gulf of Alaska Navy Training Exercises Draft Environmental Impact Statement/Overseas Environmental Impact Statement

Request for Comment Consideration
The Basel Action Network (BAN) submits these comments on the Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for proposed Gulf of Alaska (GOA) training exercises. BAN requests consideration of the comments because they present new information that was not previously available during the comment period.

The Florida Fish and Wildlife Conservation Commission released a report in May 2010, summarizing a five-year post-sinking monitoring study on PCB leaching from the sunken Ex-USS Oriskany. The study reveals PCB concentrations in fish caught at the Oriskany site at more than twice the EPA screening limits and above the Florida Department of Health's fish advisory limits. PCB sampling results are discussed below and are relevant to the environmental impacts of the Navy's SINKEX activity in the Gulf of Alaska.

While the comment period for the draft EIS has closed, the comments provided below contain new information showing that the proposed GOA training exercises will affect the quality of the environment in a significant manner not addressed under the draft EIS. Therefore, BAN requests consideration of this new information in the final EIS or through a supplemental EIS. See 40 C.F.R. §1502.9(c)(1)(ii); Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 374 (1989).

I. Comment: Impacts from SINKEX vessels.
The Draft EIS/OEIS acknowledges that Sinking Exercises (SINKEX) will occur in the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA); however, the long-term environmental impacts associated with SINKEX are not discussed in the Draft EIS/OEIS.

The Navy has in the past acknowledged the presence of hazardous materials remaining within the composition of scuttled naval vessels, including, but not limited to: polychlorinated biphenyls (PCBs), asbestos, iron, lead paint, antifouling paint containing tributyltin (TBT), and polybrominated diphenyl esters (PBDEs). Yet these materials and their effects on the environment, marine life and human health are not discussed in the Draft EIS/OEIS. We ask for additional assessment of the risks associated with the ocean disposal of these toxic materials in the GOA pursuant to the SINKEX program. The assessment should state the specific amounts of each material (mentioned above) expected to be left onboard scuttled vessels, as well as their expected impacts on the environment, marine life, and human health.

II. Comment: SINKEX impact assessment is based on inconclusive research.
While removal of liquid PCBs is required before a vessel is scuttled via SINKEX, the complete removal of all or most solid material containing PCBs is not. The SINKEX general permit issued under 40 CFR 229 states *"The Navy may leave in place wire cables, felt gaskets and other felt materials that are bonded in bolted flanges or mounted under heavy equipment, paints, adhesives, rubber mounts and gaskets and other objects in which the Navy has found PCBs..."* In effect, SINKEX vessels contain large quantities of PCBs which remain in the vessel during and following sinking and are thus exposed to the marine environment.

Current SINKEX remediation practices were developed 11 years ago (1998-1999) and were based on the Sunken Vessel Study that assessed the impacts of a single SINKEX vessel, the Ex-USS Agerholm, 17 years after the vessel's 1982 sinking. At the time of the assessment, solid PCBs were not believed to leach into the marine environment and little was known about PCB transport in an aqueous setting.

In fact, the EPA allowed SINKEX to operate solely under the General Permit (issued under the Marine Protection, Research and Sanctuaries Act) and exempt from the Toxic Substances Control Act, because there was a *"lack of evidence of unreasonable risk to human health or the environment..."* considering the type of PCB material involved (solid PCBs).[1] They stated *"Solid PCBs are not believed to be readily leachable to the marine environment."*[2] These conclusions are not supported by current scientific research. While further research is both necessary and appropriate to assess the environmental impacts of SINKEX vessels, particularly the impacts of PCBs on the environment, marine life and human health, continued reliance on out-dated research is not appropriate.

III. Comment: New study shows detrimental impacts from sunken naval vessel.
In the 11 years since this *Sunken Vessel Study* (Ex-USS Agerholm), new research confirms that solid PCBs leach into the marine environment, are taken up by marine organisms, and are transferred up the food chain.

The Ex-USS Oriskany was sunk as an artificial reef 23 nautical miles off the coast of Florida in 2006 and was prepared for sinking in much the same way as SINKEX vessels. All liquid PCBs were removed from the vessel prior to sinking; therefore all documented PCB leaching is from solid PCBs. 33% of all fish sampled post-sinking in the vicinity of the Oriskany had PCB concentrations above 20 parts per billion (ppb), the EPA screening level. 21% of all fish sampled post-sinking had PCB concentrations above 50 ppb, the Florida Department of Health fish advisory threshold. Total PCB concentrations in fish samples increased 1,446% on average from pre-sinking to post-sinking.

	Pre-Sinking Oriskany Site	Post-Sinking Oriskany Site
Red Snapper Samples	17	157
Red Snapper Mean PCB Concentration	2.36 ppb	54 ppb
Total Samples	62	180
Total Mean PCB Concentration	3.8 ppb	58.75 ppb
Total Fish Above 20 ppb (EPA Screening Level)	2 (gag & king mackerel)	60
Total Fish Above 50 ppb (Florida DoH Fish Advisory Threshold)	1 (king mackerel)	38

Note: gag and king mackerel fish were not sampled post-sinking.
Source: Table developed by Author based on data provided by the Florida Fish and Wildlife Conservation Commission Post-Sinking Monitoring Study

[1] *Official letter from Carol Browner, EPA Administrator, to Richard Danzig, Secretary of the Navy, September 13, 1999.*

[2] *IBID*

There were also two sampling events in 2008 on a control reef; these results were also recently released in May 2010. The control reef is a concrete bridge rubble reef that is 8 miles from the Oriskany site. The control reef samples were taken on the same days as the Oriskany samples in 2008. PCB concentrations in fish caught at the Oriskany site in 2008 were more than 932%, on average, higher than PCB concentrations in fish caught at the control reef.

	2008 Control Reef	2008 Oriskany Reef
Red Snapper Samples	45	60
Red Snapper Mean PCB Concentration	7.6 ppb	55.22 ppb
Total Samples	61	61
Total Mean PCB Concentration	7.89 ppb	81.44 ppb
Total Fish Above 20 ppb (EPA Screening Level)	5	16
Total Fish Above 50 ppb (Florida DoH Fish Advisory Threshold)	0	12

Source: Table developed by Author based on data provided by the Florida Fish and Wildlife Conservation Commission Post-Sinking Monitoring Study

The Oriskany sampling does not merely show fish contamination in the state of Florida; rather, it shows that more than 100 naval vessels intentionally sunk in the last 10 years alone (through SINKEX and artificial reefing) have placed the marine environment and human health at unreasonable risk of toxic exposure. These risks must be assessed in the GOA EIS.

IV. Comment: PCB transport via physical and biological means.
The Navy has long argued that PCB releases in the deep ocean from SINKEX vessels (6,000 feet or greater) do not pose adverse risks to marine life at that depth. Further, the Navy has suggested that the deep benthic environment has minimal chance of physical or biological transport to the shallow marine ecosystem. However, the Draft EIS/OEIS does not have any discussion or analysis of PCB releases in the deep ocean and possible transport mechanisms.

There are at least three scientifically acknowledged modes of material transport from the deep ocean to shallow waters:

1. Upwelling;
2. Meridional Circulation Overturning; and
3. Biographic Transport.

First, the physical marine transport process called *upwelling* routinely moves materials from deep water to surface water.[3] Upwelling can occur in coastal regions as well as the open ocean,[4] and can be wind or tide-induced. Both types of upwelling do not typically occur in isolation, but rather coexist.[5] Upwelling is a vital ecological process that delivers nutrients from the benthic zone (sea floor); however, this same process is also capable of delivering PCBs from sunken Navy vessels to shallow waters.

Second, deep ocean currents and water circulation produces dynamic uplift capable of delivering sediments, with which PCBs adhere, to surface waters. Traditionally, this is known as Meridional Circulation Overturning (ocean conveyer belt), in which currents driven by wind, thermohaline circulation, and atmospheric conditions transport deep water to shallow water.[6]

[3] *Tomczak, M., 1998. Shelf and Coastal Oceanography. http://www.es.flinders.edu.au/~mattom/ShelfCoast/notes/chapter06.html*

[4] *http://oceanmotion.org/html/background/upwelling-and-downwelling.htm*

[5] *Tomczak, M., 1998. Shelf and Coastal Oceanography. http://www.es.flinders.edu.au/~mattom/ShelfCoast/notes/chapter06.html*

[6] http://earthobservatory.nasa.gov/Newsroom/view.php?id=24124

Finally, marine life that has taken up PCBs in deep water at the disposal site can transport PCB material via migration and predatory consumption to the shallow marine ecosystem, which can continue up the food chain to humans. Sunken vessels typically rest in the bathylpelagic zone (1,000-4,000 meters), just below the mesopelagic zone (200-1,000 meters), which exists below the epipelagic zone (200 – surface). Biographically speaking, organisms from each zone have contact with organisms from the zone above and below, allowing for food transfer and PCB uptake through the water column. "*Undoubtedly, there is considerable trophic interaction among these larger epipelagic fishes* [albacore, blue shark, swordfish, etc.] *and their meso- and bathypelagic counterparts during diel vertical migration.*"[7]

Additionally, the Deep Scattering Layer (DSL) is an assemblage of vertically migrating marine organisms that travel from the deep ocean to the shallows at night to feed, thus trophic interaction occurs.[8] DSLs have been recorded at all depths to 3,000 meters.[9]

The physicochemical properties of PCBs, including low solubility in water, very high bioconcentration factor, and very low degradation rates, determine their behavior in the environment.[10] And because PCBs are very hydrophobic (readily come out of solution), persistent, and highly lipophilic (partition into lipids and organic carbon) they readily adsorb onto particles and build up in the food chain (bio- and geoaccumulation).[11]

PCBs and other hazardous materials left on SINKEX vessels are in no way confined to the dumping site. PCBs can be transported great distances from the initial sink site via physical and biological means. The GOA EIS must include impact analysis of possible PCB transport mechanisms.

In closing, we thank you for the opportunity to submit comments on the draft EIS/OEIS and are hopeful that our concerns will be addressed in the final EIS. Should you have any questions please do not hesitate to contact me directly.

Sincerely,

Colby Self
Basel Action Network
206.250.5652

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[7] *Monterey Bay National Marine Sanctuary Site Characterization – Biological Communities and Assemblages – Pelagic Zone. http://montereybay.noaa.gov/sitechar/pelagic5.html*

[8] *IBID*

[9] *Opdal, A.F., Godo, O.R., Bergstad, O.A., Fiksen, O, 2007. Distribution, identity, and possible processes sustaining meso- and bathypelagic scattering layers on the northern Mid-Atlantic Ridge*

[10] *Mackay, D., W.Y. Shiu, and K.C. Ma, 1992. Illustrated handbook of physical-chemical properties and environmental fate for organic chemicals, Vol. I, Monoaromatic Hydrocarbons, Chlorobenzens, and PCBs. Lewis Publishers, Boca Raton, FL, 697pp.*

[11] *Froescheis, Oliver, Ralf Looser, Gregor M. Cailliet, Walter M. Jarman and Karlheinz Ballschmiter, 2000. The deep-sea as a final global sink of semivolatile persistent organic pollutants? Part I: PCBs in surface and deep-sea dwelling fish of the North and South Atlantic and the Monterey Bay Canyon (California), Chemosphere, Volume 40, Issue 6, March 2000, Pages 651-660.*

I.1.6 AMANDA BENTLEY

November 2010

Dear Mrs. Amy Burt,

I wish to express my concern regarding the Navy's use of mid-frequency active sonar in the Gulf of Alaska in the summer of 2011. I understand that it is the intention of the Navy to undergo extensive training exercises at that time. I also understand and respect the need to maintain a level of military readiness against any and all potential threats against the United States. However, my goal for writing this letter is to open your eyes to serious and fatal damage that the Navy may inflict upon innocent and endangered marine life.

All marine life thrives on the peacefully balanced acoustic environment underwater. Disruptions to this habitat can risk animal life. It is no secret that mid-frequency sonar in aquatic environments even 300 miles from the source retains an intensity of 140 decibels, equating to a hundred times more intense than the level known to alter the behavior of large whales. The use of mid-frequency active sonar is so detrimental that it causes whales and marine mammals to dramatically change their behavior and flee their aquatic habitat forcing them to surface too quickly. Surfacing too quickly causes "the bends" resulting in cranial hemorrhaging. On multiple occasions, whales and sea turtles, too many to count, have been the sacrifice of the Navy's training exercising. Originating from a very patriotic background, I understand and fully support military readiness. However, this sort of environmental harm seems out of control. Countless whales, porpoises and other mammals strand during naval exercises: in October of 1989, 20 whales of three species stranded during naval exercises near the Canary Islands.; in January of 2006, at least 34 whales beached themselves to avoid the sonar along the coast of the Outer Banks of North Carolina as training was carried out by a naval fleet.

In an article published in the Juneau Empire, in January of 2010, it states that the Navy plans to carry out one of three proposed procedures: 1. No action as the Navy would have already reached its status quo of annual training; 2. Called Alternative 1, where the Navy increases training to a 21-day period and includes the use of mid-frequency active sonar; lastly 3. Called Alternative 2 which includes Alternative 1 plus a sinking exercise during the three week training period. I urge you to commit to your first option and halt any and all training in the Gulf of Alaska; the Navy has already it meet its annual required training between April and October, according to Eric Morrison in "Concerns grow over Navy Sonar training in the Gulf of Alaska" in January, 2010. Even though Shelia Murray, the regional environmental public affairs officer for the Navy, states in the same article, "The Navy does a lot of things to avoid any type of interaction with any type of marine mammal" there still seems to be numerous fatal strandings of aquatic life. Can the death of innocent marine life be on the Navy's conscience? Can it be on yours?

As a citizen of the earth, we all have a responsibility to preserve the life it holds. Exterminating a species, or even endangering its well-being is a serious offense as this action could be irreversible. Every organism, animal and habitat is essential to the balance of the environment. I ask that this be taken into consideration during training exercises. I hope you will find it logical and moral to limit the training exercises using such dangerous technology as mid-frequency active sonar.

Thank you for your time,

Amanda Bentley
2000 East Henrietta Rd.
Rochester, NY 14623

Sunday, January 17, 2010
Story last updated at 1/17/2010
Concerns grow over Navy sonar training in Gulf of Alaska
Environmentalists say testing of technology could harm sea life

By Eric Morrison | JUNEAU EMPIRE

Environmentalists and Alaska residents are up in arms over U.S. Navy plans to train with controversial mid-frequency active sonar in the Gulf of Alaska beginning in the summer of 2011.

The Navy says the active sonar is necessary for national security. Environmentalists warn the technology could be extremely harmful to marine mammals in the area.

The Navy held meetings throughout Alaska last week to discuss its Gulf of Alaska Training Activities Environmental Impact Statement that lays out three options for the future of the annual training.

"Basically our ultimate proposed action is to accomplish Navy training in the Gulf of Alaska," said Amy Burt, a Navy environmental planner and the project manager for he GOA EIS. "The three alternatives are different ways to accomplish the proposed actions."

The first option is no action, which would maintain the status quo of annual Navy training that takes place during 14-day period between April and October. The second option, which the Navy is calling Alternative 1, would increase the training to a 21-day period between April and October and would include use of mid-frequency active sonar.

"So we would do more training exercises associated with active sonar and also Alternative 1 would accommodate some increased level of training for some new systems and ships that are coming into the fleet," Burt said.

The third option, called Alternative 2, would be the same as Alternative 1 but would include a second 21-day training exercise and the possibility of a sinking exercise during each three-week period. The Navy would take decommissioned ships and clean them to Environmental Protection Agency standards that would be used as live fire target practice at least 50 nautical miles from shore and sunk in at least 6,000 feet of water.

The Navy presently conducts a joint exercise each summer with the U.S. Army and U.S. Air Force that it calls the Northern Edge exercise. Part of the exercise takes place in an area designated as the Gulf of Alaska Temporary Maritime Activities Area that is the shape of a polygon and is approximately 300 nautical miles in length and 150 nautical miles in width located south of Prince William Sound and east of Kodiak Island.

The use of mid-frequency active sonar has become a highly controversial issue in environmental circles because it is believed to have detrimental effects on marine mammals, particularly whales.

"The active sonar is something that we're pretty concerned about," said Jon Warrenchuck, an ocean scientist for the nonprofit international marine conservation and advocacy organization. "These exercises are planned off of Kodiak and it's right beside critical habitat for Northern Right whales and there are about 100 of these left in Alaska, they estimate. They're, if not the rarest, probably one of the rarest marine mammals in the world. This is one of the areas they've identified as critical habitat for them. It's right beside the proposed training area."

Sheila Murray, the regional environmental public affairs officer for the Navy, said there is a possibility that the mid-frequency active sonar could have adverse effects on marine mammals but said the Navy tries to avoid any type of interaction with marine mammals wherever possible. The sailors go through extensive training and there are 29 protective measures in place to minimize impacts, which includes flyovers and turning off sonar within 200 yards of marine mammals, she said.

"The Navy does a lot of things to avoid any type of interaction with any type of marine mammal," Murray said.

Tina Brown, a wildlife activist who attended the meeting in Juneau last week, said many people have concerns about how damaging the sonar potentially is to marine mammals.

"Even the people who were at the hearing to give us information did not know for the sure the effect that Navy sonar testing would have on these animals," she said. "They know that whales have been beached in areas where sonar has taken place. They don't always know that sonar caused it."

Murray said there has been some misperception in the public from language used in the EIS that people interpret to mean that anywhere from thousands to millions of marine mammals could be harmed. The Marine Mammal Protection Act requires the Navy to estimate how many "takes" it expects with the sonar.

"It does not necessarily mean kill," she said. "It's anything that changes that marine mammal's behavior. That seems to be the one thing the public doesn't seem to understand. It's not Navy language, it's regulatory language."

Some people have estimated that millions of marine mammals could die from the sonar, which Murray said is not what the EIS actually says.

"People seem to think that that is the number of marine mammals that the Navy anticipates some type of mortality happening to and that's far from the truth," she said.

The mid-frequency active sonar is believed to scare whales and could cause them to run aground, but it has been difficult to prove in the past because the Navy hasn't always had a strong track record of disclosing what its been doing, Warrenchuck said.

"There's a lot of scientific evidence out there that this type of sonar can affect whales, and particularly those that have the big melons," he said. "And 'melon' is actually a biological term for kind of the protruding head of certain whales like sperm whales or some of the beaked whales. Basically they have this big fluid-filled organ that they use for echolocation and communication and navigation and things."

Warrenchuck and Brown also mentioned concerns about the increased pollution to the area if more training is approved and more military ordinance is used and discarded in the Gulf of Alaska.

Murray said the sonar is vital for the Navy to use to protect the country.

"It actually is the only effective method for detecting any kind of threats from any modern ultra quiet submarines that countries that may not be friendly with the United States may use," she said. "There are a lot of other subs out there that use it and that is the only way the Navy can actually detect them."

Brown said she is not opposed to the Navy training, she's just opposed to where, when and how it is planning to train.

"I understand we are at war," she said. "This is not the issue. The issue is choosing a place that has such an abundance of marine wildlife and choosing that place at the time when that wildlife is most abundant. In my view that is irresponsible."

The public comment period for the draft EIS ends Jan. 25 and will then be revised by the project team. A final EIS is expected sometime in the late fall or early winter, which will also have a public comment period. A Record of Decision is expected sometime in late 2010 or early 2011 that will decide on one of the three training options.

"The summer season of 2011 would be the first time we could do anything under the EIS," Burt said.

People can make comments online at www.gulfofalaskanavyeis.com until Jan. 25 or can send a letter to the Navy by that date.

Warrenchuck said he hopes the Navy will ultimately decide on the first option and not change its training to include sonar in the Gulf of Alaska.

"We're not at war with the whales and so we would really like the Navy to minimize their impact on whales and marine mammals," he said.

• Contact reporter Eric Morrison at 523-2269 or eric.morrison@juneauempire.com.

I.1.7 GREG BROWN

United States Navy

Public Hearing Comment Form

Gulf of Alaska Navy Training Activities
Draft Environmental Impact Statement/
Overseas Environmental Impact Statement

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Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt - Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

☐ *Please check the box if you would like to receive a CD copy of the Final EIS/OEIS. Provide your mailing address below.*

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Name: GREG R. BROWN

Organization/Affiliation:

Address:* 19400 Beardsley Way

City, State, Zip Code: Juneau, AK 99801

Comments: Attached.

Visit www.GulfofAlaskaNavyEIS.com for project information.

*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

GOA Navy Sonar Reasons for Concern

GREG R. BROWN
19400 Beardsley Way
Juneau, AK 99801

From: tmbrown3@aol.com
To: Brown_greg@Yahoo.com
Cc: TMBrown3@aol.com
Subject: GOA Navy Sonar Reasons for Concern
Date: Wed, Jan 20, 2010 3:53 pm

Marine Mammals

The Situation: The Navy has been authorized to take two million mammals per year for the next five years during its training exercises in Hawaii, the west coast, the Gulf of Mexico, and the entire Eastern seaboard; in fact, the Navy wants to deploy sonar in 80% of the world's oceans. Obviously, this issue greatly affects all of Alaska.

The immediate Alaskan concern, however, involves proposed Navy training activities in the Gulf of Alaska (GOA). All public comments must be received or postmarked no later than January 25, 2010, so time is of the essence. You may comment online at www.GulfofAlaskaNavyEIS.com. Please see below for points on which to comment.

Marine Mammals

1. According to the Marine Mammal Commission, "The Gulf of Alaska supports a diversity of marine mammals, a number of which are listed as endangered or threatened under the Endangered Species Act or designated as depleted under the Marine Mammal Protection Act. They include pinnipeds (Stellar sea lions, northern fur seals, and sea otters) and cetaceans (AT1 killer whales, eastern North Pacific right whales, Cook Inlet beluga whales), humpback whales, fin whales, sperm whales, and sei whales....Several of them are in especially critical conditions....

2. The Ocean Mammal Institute, a federal agency created to help protect marine mammals, stated serious concerns about the effects of the Navy's use of LFAS, explaining that the possible effects on marine mammals could include the following:

- death from trauma
- hearing loss
- disruption of feeding, nursing, sensing and communication (Abandoned calves have been reported in affected areas.)
- stress (making animals more vulnerable to disease and predation)
- changes in distribution and abundance of important marine mammal prey species
- subsequent decreases in marine mammal survival and productivity.

All of these effects have been witnessed in the past. See the Ocean Mammal Institute's publication "US Navy's Misinformation To Congress About LFAS." Additionally, MSNBC reported that "A National Oceanic and Atmospheric Administration study said the Navy's use of sonar contributed to the beaching of 16 whales and two dolphins in the Bahamas in 2000. Eight of those whales died, showing hemorrhaging around their brains and ear bones, possibly because they were exposed to loud noise."

3. Many scientists believe that animals seen stranded on the beach as a result of Navy sonar testing represent only a small portion of the technology's toll because severely injured animals rarely come to shore. In fact, scientists believe that mid-frequency sonar blasts may drive

certain whales to change their dive patterns in ways their bodies cannot handle, causing debilitating and even fatal injuries; these symptoms are akin to a several case of "the bends." (NRDC) In fact, the true effects of Navy sonar testing on marine wildlife remains unknown.

4. The June, 2010, issue of Scientific American reported that the U.S. Navy's sonar generates "slow-rolling sound waves topping out at around 235 decibels, equivalent to the intensity of a Saturn rocket; the world's loudest rock bands top out at only 130. The Navy confirms that these sound waves can travel for hundreds of miles under water, and can retain an intensity of 140 decibels (100 times more intense than the level known to alter the behavior of large whales) as far as 300 miles from their source."

5. The Navy does not consider the potential cumulative impacts from multiple sound exposures. For example whales in the GOA migrate to Hawaii. The Navy seeks to cover 80% of the world's oceans with its sonar testing, including the west coast of the U.S. as well as Hawaii. Over time, multiple exposures could lead to impaired hearing abilities, as studies on the effects of sound on terrestrial mammals has shown. Too, feeding behavior and other vital behavior could be altered repeatedly, the cumulative effects of which could prove fatal.

6. The Navy does not consider the marine animals that may be affected by sonar at a significant distance from the source.

7. The Navy does not take into account the added noise pollution caused by the increase in vessel traffic during training.

8. The Navy does not consider the possibility of strikes by sub-surface submarines during transit and/or operations. The Navy lacks any evidence that passive listening is a reliable means of detecting nearby marine life.

9. Although the risk of surface vessel strikes is heightened by its operations, the Navy does not note the many limitations on the ability to see and avoid collisions with marine mammals, instead repeatedly touting lookouts as an effective means to avoid collisions with whales. The limited effectiveness of using lookouts is widely documented, yet the Navy fails to take into account the difficulty to see animals as well as the fact that many marine mammals remain under water for considerable periods of time. Beaked whales, for example, can spend up to an hour under the surface, with only short and intermittent surface intervals.

10. The Navy fails to consider the adverse impact of the massive amounts of debris that will be disposed of in the oceans during its training periods. Entanglements are serious concerns for marine mammals, often resulting in death.

11. Clearly it is likely that certain impacts on marine mammals from the Navy operations may fall within the category of Level A Harassment.

Fish and Other Marine Wildlife

12. The Navy has not evaluated the consequences of its sonar on marine fish.

12. The Navy does not provide analysis of the cumulative effects of sonar testing on commercial fishing, yet the National Marine Fisheries Service believes that sonar testing could directly and indirectly impact federally managed fishery species in North Carolina. (North

Carolinians for Responsible Use of Sonar)

13. Not everything is known about the effects of sonar on fish, but studies show that intense sound can damage fish's ears, reduce the viability of eggs and harm larvae, and retard growth. Intense sound can also cause fish to change their behavior, disrupt their navigation, communication, foraging, and schooling - and dramatically reduce catch rates. (NC Coastal Federation)

14. According to the Times-Standard, "the Navy says that shock waves from inert bombs, intact missiles and targets hitting the water's surface would injure fish in some areas," and that "underwater explosions...could hurt invertebrates...."

15. Walt Duffy with the U.S. Geological Survey's Cooperative Research Unit at Humboldt State University points out that there is limited information on the effects of sound on fish. He said that "how the activities the Navy proposes might affect surfacing and migrating salmon are also open to question." (Times-Standard)

16. Arthur N. Popper, biology professor at the university of Maryland and expert in fish hearing, states, "The effects of sound on fish could potentially include increased stress, damage to organs, the circulatory and nervous systems. Long-term effects may alter feeding and reproductive patterns in a way that could affect the fish population as a whole."

17. The reproductive functions of shrimp and crabs may also be affected by intense underwater noise. (NC Coastal Federation)

18. The Navy has not considered the possible effects on seabirds.

Humans and Marine Wildlife

19. The Navy has not addressed the issue of sea pollution. Humans cannot survive without a healthy ocean, and already the North Pacific is known for the North Pacific Gyre, a plastic "graveyard" at least twice the size of Texas; some believe it to be as large as the entire continental United States.

20. The Navy has not addressed the issue of air pollution.

Closing

- In October 2004 the European Parliament called for a ban in European waters of military sonar equipment and asked its twenty-five member states to stop deploying high-intensity active naval sonar. (Marine Connection)

- In November 2004, delegates at the meeting of the parties to ACCOBAMS (the United Nations Environment Program's Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area) adopted a resolution recognizing that ocean noise generated by humans is a dangerous pollutant to marine life. (Marine Connection)

- In November 2004, the World Conservation Union called for action to reduce the impact of high-intensity active sonar and other sources of damaging underwater sound. (Marine

Connection)

- The North Carolina Watermen United has presented a statement opposing Naval sonar training off the coast of North Carolina.

**** Alaskans depend on the sea for food, for income, and for pleasure. Clearly the Navy needs to train, but choosing training areas in some of the most prolific marine wildlife regions in the United States, if not the world, particularly at a time when migrating marine life is present, is, at best, irresponsible. We therefore support the "No Action Alternative," which provides for the continuation of training activities within the Alaska area at the current levels.***

Additional sources: Southern Environmental Law Center, Atlanta, Georgia

Turning the Tides, Sitka, Alaska, Chapter, Lynn Wilbur

I.1.8 TINA BROWN

United States Navy

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Name: Tina M. Brown

Organization/Affiliation:

Address:* 19400 Beardsley Way

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TINA M. BROWN
19400 Beardsley Way
Juneau, AK 99801

From: tmbrown3@aol.com
To: Brown_greg@Yahoo.com
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Subject: GOA Navy Sonar Reasons for Concern
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14. According to the Times-Standard, "the Navy says that shock waves from inert bombs, intact missiles and targets hitting the water's surface would injure fish in some areas," and that "underwater explosions...could hurt invertebrates...."

15. Walt Duffy with the U.S. Geological Survey's Cooperative Research Unit at Humboldt State University points out that there is limited information on the effects of sound on fish. He said that "how the activities the Navy proposes might affect surfacing and migrating salmon are also open to question." (Times-Standard)

16. Arthur N. Popper, biology professor at the university of Maryland and expert in fish hearing, states, "The effects of sound on fish could potentially include increased stress, damage to organs, the circulatory and nervous systems. Long-term effects may alter feeding and reproductive patterns in a way that could affect the fish population as a whole."

17. The reproductive functions of shrimp and crabs may also be affected by intense underwater noise. (NC Coastal Federation)

18. The Navy has not considered the possible effects on seabirds.

Humans and Marine Wildlife

19. The Navy has not addressed the issue of sea pollution. Humans cannot survive without a healthy ocean, and already the North Pacific is known for the North Pacific Gyre, a plastic "graveyard" at least twice the size of Texas; some believe it to be as large as the entire continental United States.

20. The Navy has not addressed the issue of air pollution.

Closing

- In October 2004 the European Parliament called for a ban in European waters of military sonar equipment and asked its twenty-five member states to stop deploying high-intensity active naval sonar. (Marine Connection)

- In November 2004, delegates at the meeting of the parties to ACCOBAMS (the United Nations Environment Program's Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area) adopted a resolution recognizing that ocean noise generated by humans is a dangerous pollutant to marine life. (Marine Connection)

- In November 2004, the World Conservation Union called for action to reduce the impact of high-intensity active sonar and other sources of damaging underwater sound. (Marine

Connection)

- The North Carolina Watermen United has presented a statement opposing Naval sonar training off the coast of North Carolina.

**** Alaskans depend on the sea for food, for income, and for pleasure. Clearly the Navy needs to train, but choosing training areas in some of the most prolific marine wildlife regions in the United States, if not the world, particularly at a time when migrating marine life is present, is, at best, irresponsible. We therefore support the "No Action Alternative," which provides for the continuation of training activities within the Alaska area at the current levels.***

Additional sources: Southern Environmental Law Center, Atlanta, Georgia

Turning the Tides, Sitka, Alaska, Chapter, Lynn Wilbur

I.1.9 CIVIL AIR PATROL

United States Navy

Public Hearing Comment Form

Gulf of Alaska Navy Training Activities
Draft Environmental Impact Statement/
Overseas Environmental Impact Statement

Please record your comments on this form to let the U.S. Navy know what concerns and comments you have on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). You may submit your comments by:

1) Depositing this form at the Comment Table before you leave tonight.
2) Submitting your comments via the project Web site at **www.GulfofAlaskaNavyEIS.com**
3) Mailing this form to:
Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt – Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

☐ *Please check the box if you would like to receive a CD copy of the Final EIS/OEIS. Provide your mailing address below.*

All comments must be received or postmarked no later than January 25, 2010, to be considered in the Final EIS/OEIS.

Name: 2Lt Daniel Holt CAP
Organization/Affiliation: Civil Air Patrol
Address:* 8391 Airport Blvd. #2
City, State, Zip Code: Juneau, AK 99801
Comments: How can CAP be involved, help with your training activities?

Visit www.GulfofAlaskaNavyEIS.com for project information.

*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

I.1.10 CORDOVA DISTRICT FISHERMAN UNITED

Cordova District Fishermen United
P.O. Box 939
Cordova, AK 99574

January 24, 2010

Naval Facilities Engineering Command Northwest
Attn: Mrs. Amy Burt
Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Dear Mrs. Burt,

I am writing in response to the Draft Environmental Impact Statement relating to the Gulf of Alaska Navy Training activities. Cordova District Fishermen United (CDFU) would like to clearly state for the record that we support the U.S. Navy in their efforts to defend our great country, however we are strongly opposed to an increase in U.S Navy training exercises in the Gulf of Alaska (GOA), and in particular the use of mid-frequency sonar. We support the No Action Alternative and support a review of existing practices.

CDFU is a nonprofit political advocacy organization that directly represents the commercial fishing interests of over 1,000 fishermen in Prince William Sound, and indirectly supports the economic livelihood of the community of Cordova. For over 75 years, CDFU has strived to protect the health and sustainability of species that inhabit our waters and errs on the side of caution when assessing potential risks to these species.

As you should be aware through your extensive EIS process, Alaska has one of the richest ocean environments in the world, and the sustainability of our fisheries resources is of highest priority to our State – both from an economic and cultural perspective.

Thank you for the opportunity to comment on the Draft EIS. CDFU looks forward to reviewing the Final EIS and requests inclusion on the Navy postal mailing list to receive a full, printed copy when it is published.

Additionally, CDFU would like to request that the comment period for the Final EIS be increased to provide sufficient time for Alaska communities to respond – longer than the timeframe given during the comment period for the draft EIS, and at least 90 days.

Sincerely,

Rochelle van den Broek
Executive Director

CDFU COMMENTS

Section: 4.1.3.1 Fishing & Section 2.6 FISH

During the explanation of commercial fishing activities there is a vague mention that a number of fisheries are at very depressed levels or are closed (referencing Richardson and Erickson 2005). The remainder of this section goes on to describe those fisheries that are currently in operation.

As acknowledged in the Draft EIS, Pacific Herring (Clupea Pallasii) are present in the GOA.

Despite the fact that this commercial fishery is currently not in operation, Pacific Herring are an ecologically and commercially significant species in the Gulf of Alaska and Prince William Sound ecosystem. Few species are of greater combined ecological and economic importance in Prince William Sound (and in many other coastal ecosystems) than is the Pacific herring[1].

Pacific Herring are central to the marine food web; providing food to marine mammals, birds, invertebrates and other fish. The Exxon Valdez Oil Spill Trustee Council (EVOSTC), a council charged with overseeing the restoration of the injured ecosystem through the use of the $900 million civil settlement and which consists of three state and three federal trustees (or their designees), has classified Pacific Herring as damaged and "Not Recovering"[2]. Pacific herring have not met their recovery objective. No strongly successful year class has been recruited into the population and health indices suggest that herring in the Sound are not fit.

Pacific herring are the subject of ongoing Trustee Council-funded research. Through this research, and the work of the Alaska Department of Fish and Game, Prince William Sound communities are hopeful for the return of a viable herring fishery in the future and are actively working towards this goal.

The collapse of the Pacific Herring fishery following the *ExxonValdez* oil spill indicates that this species is not particularly resilient to changes in their immediate marine environment. CDFU is concerned that the effects of mid-frequency sonar use in the GOA will stress an already weakened population and do not feel that this species was adequately addressed in the Draft EIS.

Acoustic Effects of Underwater Sounds to Fish

Despite their lack of resilience to changes in their environment, Pacific Herring

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[1] Brown ED and MG Carls. 1998. Pacific Herring *Clupea Pallasi*. Restoration Notebook, Sept. 1998. Exxon Valdez Oil Spill Trustee Council.

[2] Exxon Valdez Oil Spill Trustee Council. Nov, 2006. Exxon Valdez Oil Spill Restoration Plan. Update on Injured Resources and Services 2006.

(Clupeidae) have the highest hearing range indicated of all marine species identified in the GOA, at 5 kHz. Some studies, however, demonstrate that the hearing range of the Pacific Herring is in fact much greater. Wilson and Dill (2002) reported that Pacific herring (Clupea pallasii) responded to sounds up to 140 kHz. As hearing "specialists", Pacific Herring have the ability to hear over a much wider frequency range than most other fish.

Of grave concern to CDFU is the lack of available research that demonstrates the short and long term impacts to fish and marine mammals. It is apparent that there is very limited research available that focuses on the impacts of mid-frequency sonar use to fish, Pacific Herring in particular and the limited research that is available suggests that there is not only variation in effects of intense sound sources on different species of fish, but that there may also be differences based on genetics or development. Indeed, one can go even further and suggest that there may ultimately be differences in effects of sound on fish (or lack of effects) that are related to fish age as well as development and genetics, as was demonstrated by Popper et al. (2005).

Many references included in this section cite data based on freshwater fish, species not included in the GOA, and entirely different environmental conditions. These references do not fully describe the impacts to GOA specific species as there simply is not research available in this area.

Since the collapse of the herring fishery in 1996, millions of dollars have been expended to help scientists understand more about the inability of Pacific Herring to fully recover from the impacts of the *ExxonValdez* oil spill. The ultimate goal of this research is to work towards the restoration of the Pacific Herring fishery returning it to its former abundance.

The lack of adequate research on mid-frequency sonar on Pacific Herring, and other fish species in the Gulf of Alaska is alarming. It is incomprehensible that a Department of U.S. Government (EPA or the DOD) would support any alternative other than the No Action alternative based on this lack of information and available research.

4.2.8.2 Ship Strikes

This section states that releasing individual expended materials would not have any significant effects on the environment, but does not indicate whether the cumulative effect of adding specific contaminants into the marine environment was fully analyzed. Elevated concentrations of certain chemicals can cause adverse effects on aquatic biota including reduced survival, impaired reproduction, and reduced growth. Release of toxic substances in the water may be quickly diluted; however, some toxic substances have the potential to bioaccumulate in the food chain.

Information included in the Draft EIS is not sufficient to detail the myriad of toxic chemicals that will be released into GOA waters, and the tendency of each specific chemical to bioaccumulate. A table describing each chemical's tendency to bioaccumulate (or not) would more accurately demonstrate the long-term environmental impacts of the proposed training activities. Currently, this area is severely lacking

despite the extreme quantities of foreign chemicals that are proposed to be expended in the GOA. It is likely that this too is an area where research is lacking.

Table 3.2-2: Failure and Low-Order Detonation Rates of Military Ordnance

The failure rate of guns, grenades, rockets, etc. ranges from 1.78% to 8.23%. Representation as a percentage does not clearly articulate the amount of ordnance that is left in an unexploded state. As indicated in the Draft EIS, the training activities will take place in an area frequented by commercial fishermen. An increase in training activities will increase the percentage of unexploded ordnance left on the ocean floor. While the training area is large, there is no way to predict where a commercial fisherman will place their net. The fishing process can include dragging nets across the ocean floor. Unstable, unexploded ordnance poses the potential for significant risk to commercial fishermen. It is incomprehensible that the Draft EIS does not include any information on this inherent risk to public safety.

3.7.8 At-Sea Explosions

Mitigation measures used to protect marine mammals may be inadequate. The Navy uses visual inspection and passive sonar to detect marine mammals prior to and during training activities. Passive sonar does not indicate the location of marine mammals, only that they are in the vicinity. The Navy will not cease training activities simply because they detect a marine mammal on the passive sonar; they will primarily rely on visual inspections to detect marine mammals and will only cease activities if the marine mammal comes within 200 yards. Marine mammals will only be detected when they come to the water's surface, thus they may have already entered the critical threshold area before they are spotted. Migration patterns should be studied and training exercises should occur outside of their migration routes.

Ordnance cannot be released and explosives cannot be detonated until the target area is determined to be clear. Training activities are halted immediately if cetaceans, pinnipeds, or sea turtles are observed in the target area. The Gulf of Alaska is prone to extreme weather and severe storms occurring regularly during the intended training exercise timeframe. The Draft EIS is lacking information relating to adverse weather conditions and how this would significantly impede Navy's ability to visually detect marine mammals and large schools of fish. This topic is briefly mentioned in *Operating Procedures & Collision Avoidance* however mitigation in this scenario is not well defined.

Other

Information on the migration patterns of fish is not sufficient. More information is needed in this area to fully describe the potential impact an increase in training activities might have to salmon returning to Prince William Sound and the Copper River.

I.1.11 DOUGLAS DOBYNS

United States Navy

Public Hearing Comment Form

Gulf of Alaska Navy Training Activities
Draft Environmental Impact Statement/
Overseas Environmental Impact Statement

Please record your comments on this form to let the U.S. Navy know what concerns and comments you have on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). You may submit your comments by:

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3) Mailing this form to:
Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt - Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

☐ *Please check the box if you would like to receive a CD copy of the Final EIS/OEIS. Provide your mailing address below.*

All comments must be received or postmarked no later than January 25, 2010, to be considered in the Final EIS/OEIS.

Name: Douglas E. Dobyns, MS ENV Science

Organization/Affiliation:

Address:* c/o DIA 1107 West 8th St, #3

City, State, Zip Code: Juneau, AK 99801

Comments: In conducting exercises under either Alternative 1 or 2, it would be good to have monitoring of the distributions and population densities of marine mammals — in study times of before, during, and afterwards of equal durations — to assess whether the mammals have been herded into particular areas.

The concern for this comment is that feeding of these marine mammals might be concentrated in areas where their ecosystem impacts are unusually concentrated. The longer-term impacts to commercial fishing should be known, if there are any. Also, inter-species of marine mammal behavior should be assessed to find if exercises have caused changes.

Visit www.GulfofAlaskaNavyEIS.com for project information.

*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

I.1.12 EPA REGION 10

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

JAN 25 2010

OFFICE OF
ECOSYSTEMS, TRIBAL AND
PUBLIC AFFAIRS

Ms. Amy Burt, Environmental Planner
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, Washington 98315-1101

RE: EPA Comments on the DOD Draft EIS/OEIS for the Gulf of Alaska Navy Training Activities, EPA # 089-028-DOD

Dear Ms. Burt:

EPA has reviewed the above-referenced document (CEQ No. 20090424) in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. Section 309 specifically directs EPA to review and comment in writing on the environmental impacts associated with all major federal actions. Under our policies and procedures, we assign a rating to the Draft EIS/OEIS (herein EIS) based on the environmental impacts of the proposed action and the document's adequacy in meeting NEPA requirements.

The EIS evaluates the potential impacts associated with current and proposed Navy training activities within the Temporary Maritime Activities Area (TMAA) located in the Gulf of Alaska (GOA). The TMAA covers an area of 42,146 square nautical miles (nm^2) of surface and subsurface ocean training area and overlying airspace. The No Action Alternative evaluates the current level of Navy training in the TMAA, which entails an annual exercise of one joint force exercise occurring over a period of no more than 14 days during the summer months. Alternative 1 includes the activities under the No Action Alternative, as well as anti-submarine warfare training, use of active sonar, and incorporation of additional training activities to incorporate force structure changes. The period for training would also increase up to 21 days. Alternative 2, the Navy's Preferred Alternative, would essentially double the activity under Alternative 1 as well as incorporate a SINKEX exercise, up to 2 times per year.

Overall we find the document to be well-organized, and the tables and maps that are included are very helpful to the reader. We recognize the short-term nature of these activities, and applaud the Navy for developing an EIS in an attempt to fully evaluate the impacts of these activities. We also appreciate that the Navy considered to the extent possible other influences and stressors on resources in the TMAA, such as climate change, and went to great lengths to include a quantitative comparison of alternatives that clearly identifies the differences in impacts amongst those alternatives.

We do have concerns, however, regarding the limited range of alternatives considered, the analysis and disclosure of impacts, lack of analysis of wastewater discharges, impacts from munitions, impacts to marine mammals from mid-range active sonar, and the limited discussion

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regarding mitigation activities (such as turtle-free zones). We also offer some suggestions we believe would improve the analysis, such as incorporating more detailed information on EPA's general permit and the related Letter Agreement for SINKEX, and current information for the PM 2.5 designation for the Fairbanks area, for your inclusion in the Final EIS (Enclosure 1).

We have assigned a rating of "EC-2" (Environmental Concerns-Insufficient Information) to the Gulf of Alaska Navy Training Activities Draft EIS. A copy of EPA's rating system criteria used in conducting our environmental review is enclosed (Enclosure 2). Our rating and a copy of our comments will be published in the *Federal Register*.

Thank you for the opportunity to review and provide written comments on the Gulf of Alaska Navy Training Activities Draft EIS/OEIS. If you have any questions regarding this letter, please do not hesitate to contact Jennifer Curtis of my staff at (907) 271-6324 or curtis.jennifer@epa.gov.

Sincerely,

Christine B. Reichgott, Manager
Environmental Review and Sediment Management Unit

Enclosures

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EPA REGION 10 DETAILED COMMENTS ON THE GULF OF ALASKA NAVY TRAINING EXERCISES DRAFT EIS/OEIS

Limited Range of Alternatives

The EIS evaluates a limited range of alternatives. We believe the alternatives analysis would be much improved by including alternatives that represent a more diverse level and mix of training instead of evaluating alternatives that simply build upon one another. The inclusion of an alternative with additional appropriate mitigation (40 CFR 1502.14(f)) would also expand the range of alternatives. The use of geographic and/or temporal exclusions, even within the current timeframe and TMAA, can potentially be effective in reducing impacts to marine resources. We note that the DEIS considers this suggestion in the section discussing alternatives considered but dismissed (Section 2.3.2), but does not consider restrictions within the TMAA or identified timeframe. EPA supports the selection of alternatives that minimize the impacts to the environment while meeting the project's purpose and need. For this project, we identify Alternative 1 as the action alternative with the least impacts.

Recommendation

EPA recommends that an alternative with additional mitigation measures be developed in the Final EIS, possibly incorporating geographic and/or temporal exclusions. We recommend the identification of geographic areas where training restrictions would be especially beneficial to environmental resources, such as the Seamounts and other areas with substantial upwelling, and additional discussion of how excluding such an area would affect training goals and the underlying purpose and need. We also recommend that the Navy reconsider its selection of Alternative 2 as its Preferred Alternative as it is the alternative with the greatest impacts to resources and the environment.

Analysis and Disclosure of Impacts

We are concerned that the some of the potential impacts from project activities are not properly disclosed in the EIS. Conclusions of "no substantial effect" are not always adequately demonstrated and, on some occasions, the lack of knowledge regarding resource impacts seems to be presented as justification for a conclusion of no substantial impact. This approach is frequently in the impacts analysis, and may result in some impacts being underestimated. A possible reason for these deficiencies could be the lack of data or understanding of resources and systems in the GOA. In addition, the EIS tends to assume an even distribution of resources and impacts, which does not accurately reflect the natural distribution of aquatic resources, or the likely nature of distribution and disbursement of impacts. As a result of the approach taken, the EIS seems to have averaged the impacts over the TMAA and concluded that localized impacts would be minimal and temporary, and thus not substantial. This may not be accurate, even in the open ocean.

The following are specific examples of the above concerns:

Water quality impacts. The EIS acknowledges unavoidable effects on ocean and surface water quality, including the introduction of hazardous materials from munitions, yet

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concludes that no long-term impacts to water resources would occur, and short-term impacts are not addressed.

Sonar impacts on fish. The EIS acknowledges that the "effects of sound on fish are largely unknown" and that there is a "dearth of empirical information on the effects of exposure to sound, let alone sonar, for the vast majority of fish." However, the EIS documents a study that showed a statistically significant post-exposure mortality of 20 to 30% from simulated Naval sonar signals, and another that found the use of continuous-wave transmissions within the frequency band corresponding to swim bladder resonance will escalate this impact by an order of magnitude, resulting in affects to 0.6 percent of the total stock of juvenile fish. There is no discussion, however, that continuous-wave transmissions at such frequency will not be employed, nor is there discussion regarding the avoidance measures in response to identification of populations of fish at more vulnerable life stages. The EIS concludes, however, that "limited information currently available suggests that populations of fish are unlikely to be affected by the projected rates and areas of use of military sonar."

Recommendation

We recommend the conclusions drawn in the impact analysis be reevaluated and where impacts are unknown or potentially more substantial, the EIS be revised to reflect this. We also recommend that the assumption of even distribution/disbursement or resources and impacts be reconsidered and revised, if possible, to more accurately reflect the actual spatial and temporal distribution of both.

Wastewater Discharges

The EIS states that discharges from military vessels are not considered point source discharges under the Clean Water Act but that there are Uniform National Discharge Standards for 25 discharges for military vessels up to 12 nm. Since the EIS only considers activities beyond 12 nm, it is unclear why this information was included, particularly since there is no discussion of what the anticipated wastewater discharges (type and volume) will actually occur. There is also no discussion of the impacts that will result from the wastewater discharges.

Recommendation

EPA recommends that the Final EIS clearly identify any applicable restrictions to wastewater discharges (if any) for the proposed action, the projected types and volumes of discharges, and the anticipated impacts to marine resources from those discharges. We also recommend that the Navy consider additional appropriate mitigation measures to minimize the discharges and subsequent impacts of those discharges.

Impacts from Munitions

The EIS identifies the potential for contamination from munitions components including various heavy metals releases from sonobuoys, leaching of hazardous bomb materials, release of cyanide from torpedoes, various explosives compounds such as ammonium perchlorate, picric acid, etc., and organic chemicals from underwater detonations. The EIS concludes that there would be no long-term or substantial degradation of water resources and no short-term impacts because contaminants would be diluted in the ocean and metal materials would corrode, thus preventing the deterioration of certain objects.

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We understand the assumption regarding ocean dilution; however, we believe the assumption should be substantiated with monitoring data, particularly since such activates have been occurring for nearly a decade, and are expected to continue (and possibly increase in frequency and duration) into the foreseeable future. Because of the cumulative impacts to ocean water quality, good stewardship can no longer assume that the size of the ocean will dilute and disperse all pollutants to safe levels, especially considering that metals such as copper and lead bioaccumulate in marine organisms.

Recommendation

We recommend the development and implementation of a monitoring program for the GOA to validate the Navy's conclusions that impacts would not result in long-term degradation of water resources. The Navy should conduct the necessary monitoring to substantiate the assumptions being made regarding the lack of impacts from munitions releases into the ocean environment.

Impacts to Marine Mammals from Mid-frequency Active (MFA) Sonar

We have concerns regarding impacts to marine mammals from MFA sonar in an area that historically has not had MFA sonar activity, or such activity is not disclosed in the EIS. The EIS estimates that the Preferred Alternative will result in a total of 425,551 Level B harassments from active sonar and other non-sonar acoustic sources, and possibly one Level A harassment, affecting all species of marine mammals, including all seven listed species.

We are also concerned that the impact assessment methodology (derivation of marine mammal density) assumes a uniform distribution of animals although the EIS clearly states that this is "rarely likely true". The EIS recognizes that there are many unknowns in assessing the effects and significance of marine mammal responses to sound exposures but makes no judgment based on the estimated number of harassments as to whether these impacts are anticipated to significantly affect the species. The Council on Environmental Quality (CEQ) Regulations list criteria for assessing significance: the degree to which the effects on the quality of the human environment are likely to be highly controversial, the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks, and the degree to which the action may adversely affect endangered or threatened species (40 CFR 1508.27(4),(5) and (9) respectively). When considered in this light, impacts of MFA sonar on marine mammals may be considered significant under NEPA. We understand the Navy is working with the National Marine Fisheries Service to obtain a Letter of Authorization under the Marine Mammal Protection Act.

Recommendation

We recommend the Navy consider the scientific controversy, uncertain/unknown risks, and presence of threatened and endangered species in assessing significance of impacts from MFA sonar on marine resources. EPA recommends the Navy operate sonar at the lowest practicable level to achieve mandated training levels. We recommend the approach taken for the Hawaii Range Complex be utilized, where an additional alternative was created for the Final EIS that held sonar use at minimal (existing) levels while increasing training activity.

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Mitigation Discussion and Effectiveness

Although the EIS dedicates a full chapter to mitigation, and incorporates mitigation discussion in the impact analysis, there are several instances where the mitigation measure is not clearly identified or defined, and the relevance of the measure to actual impacts is not explained. There are also references to best management practices, Navy policies and standard operating procedures, but specific actions are not always identified, and when they are, no discussion of the anticipated effectiveness of mitigation occurs. It is important that mitigation measures be discussed, especially if they are the basis for concluding that impacts will not be substantial or will not occur at all. Results of monitoring of training impacts would also be helpful to include in mitigation discussions.

Recommendation

EPA recommends further refinement of mitigation measures to include clear identification of the measure (i.e. turtle-free zone), a discussion of the anticipated effectiveness and likelihood of implementation. Monitoring efforts should be included.

General Comments

Discussion regarding SINKEX

The EIS states that the sinking exercise (SINKEX) activities will be "conducted under the auspices of a permit from the USEPA". We recognize that this is a reference to the general permit issued by EPA under the Marine Protection, Research, and Sanctuaries Act (MPRSA) for the SINKEX. However the EIS presents very little information about the requirements and conditions of this permit, or the related August 1999 Letter Agreement between the Navy and EPA.

In addition, the EIS refers to the potential for floating non-hazardous expended material to be lost (to become persistent seabed litter) or washed ashore as flotsam. It should be noted that the SINKEX general permit states that "Before sinking, appropriate measures shall be taken by qualified personnel at a Navy or other certified facility to remove **to the maximum extent practicable** all materials which may degrade the marine environment, including without limitation removing from the hulls other pollutants and all readily detachable material capable of creating debris or contributing to chemical pollution." If the sinking exercise could create floating non-hazardous expended material that will create persistent marine debris or has the potential to wash ashore, the Navy must attempt to remove such material from the marine environment. While disposal of materials during SINKEX is a permitted activity, the EIS should disclose the amount of polychlorinated biphenyls (PCBs) that would be disposed into the ocean under each of the project alternatives.

Recommendation

We recommend that the Final EIS include additional discussion to inform the reader of the conditions with the permit and agreement, including but not limited to: the removal of all PCB transformers and large capacitors; the removal of all small capacitors to the greatest extent practical; removal of readily detachable solid PCB items; the cleaning of petroleum from

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tanks; piping and reservoirs, as well as the removal of trash, floatable materials, and mercury or fluorocarbon containing materials. The Final EIS should clearly note that the requirements of both the 1999 EPA/Navy agreement and the SINKEX General Permit under 40 CFR 229.2 are to be met in order to comply with the MPRSA SINKEX General Permit. For material that is expected to become flotsam or beach debris, we recommend the consideration of additional mitigation, such as supporting marine debris cleanup efforts in areas potentially affected by such debris.

PM2.5 Designation for Fairbanks

EPA recently finalized its rule to designate portions of the Fairbanks North Star Borough as non-attainment for PM2.5. The EIS currently contains information that is now out-of-date.

Recommendation

We recommend that the Final EIS be updated to reflect the current designation as discussed in the final rule. Please see Final Rule at: (http://frwebgate6.access.gpo.gov/cgibin/PDFgate.cgi?WAISdocID=104316123081+4+2+0&WAISaction=retrieve).

Evaluation of World War II Dumps in the GOA

During scoping, commenters identified concerns regarding past dumpsites from the World War II era, and requested that the Navy reidentify those and consider them in the analysis. There does not appear to be any discussion regarding these sites in the document outside of the scoping summary.

Recommendation

While specific information relating to the existence, location and possible constituents of past marine dump sites may not be readily available, we recommend that any reliable information (e.g. information from the marine charts referenced by the commenter) currently available be reviewed and any conclusions, even general, regarding these sites be included in the cumulative impacts assessment in the Final EIS, if possible.

Programmatic Nature of EIS

Although the document is not currently identified as a Programmatic EIS, it does appear that the EIS is programmatic in nature as it identifies, for an unknown period of time, activities that could occur within a specified range in magnitude, scale, and timeframe. As such, it may beneficial for the Navy to identify the document as programmatic and also set an estimated timeframe for which these activities re anticipated to occur (i.e. 5 or 10 years) before reevaluation, regardless of changes to the activities. We believe that reevaluation at regular intervals is important given the complexity of the marine dynamics as well as the substantial changes being observed in the GOA.

Recommendation

We recommend that the Navy consider identifying the document as a Programmatic EIS and determine a timeframe for reevaluation.

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Consideration of MPRSA

The MPRSA is not currently listed in several lists or discussions of environmental laws applicable to this project, even though it is quite relevant to the SINKEX activities.

Recommendation

We recommend including the MPRSA in lists and discussions of environmental laws throughout the document where appropriate.

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ENCLOSURE 2

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U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow-Up Action*

Environmental Impact of the Action

LO – Lack of Objections

The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

EC – Environmental Concerns

EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts.

EO – Environmental Objections

EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

EU – Environmentally Unsatisfactory

EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

Adequacy of the Impact Statement

Category 1 – Adequate

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

Category 2 – Insufficient Information

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS.

Category 3 – Inadequate

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

* From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.

I.1.13 NINA FAUST AND EDGAR BAILEY

P.O. Box 2994
Homer AK 99603

January 15, 2010

Naval Facilities Engineering Command Northwest
Attn: Mrs. Amy Burt, Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Comments RE: Gulf of Alaska Navy Training Activities EIS/OEIS

Dear Sirs:

We are appalled at the proposal to expand Navy Training Activities in the Gulf of Alaska. The fact that the Navy even does any training exercises in the spring and summer in this richly biodiverse area when many whale species are migrating north and other species are spawning or giving birth, is biologically insensitive and ecologically adverse. We are strongly opposed to any proposals to expand these operations in the Gulf of Alaska.

Alaska has a long history of toxic military waste that has recently come to light. Some of this waste will affect Alaskan waters for a long time to come. The Navy's proposal to increase ocean pollution here with the enormous addition of expended hazardous material is unconscionable, especially considering the dependency of Alaskans on salmon, crab, pollock, cod and other important seafood harvested by our fishing fleets. Adding the proposed toxins from exploded ordinances threatens Alaska's clean water and fishery resources. Considering the mess left by the bombing range at the mouth of Eagle River, we know all too well how toxic exploded ordinances are.

The Sonar testing is of grave concern to the marine mammals in Gulf of Alaska waters. It is well known and well documented that sonar can disrupt marine mammals and even kill them. The Navy knows the research. We oppose the active sonar training proposals due to the very sensitive populations of marine mammals. Populations of sea otters and sea lions have fallen dramatically in the past decade, threatening their viability. Adding the stress of sonar testing to populations that are already in trouble should not be allowed.

We do not support the proposed alternatives in the EIS/OEIS. At the very least, the exercises should stay status quo. At the best, we would like to see a cease and desist of all of these exercises in these very important marine mammal and fishery areas. The cumulative effects of the added stresses the Navy is proposing may be the too much for already stressed marine mammal populations. In Alaska, our wild resources are important for our security and that should be respected.

Sincerely,

Nina Faust Edgar Bailey

Nina Faust Edgar Bailey

I.1.14 CAROLYN HEITMAN

Sent by 'certified' mail on January 25, 2010

FROM: Carolyn Heitman
P.O. Box 2303
Kodiak, Alaska 99615
cheitman@acsalaska.net

TO: Naval Facilities Engineering Command Northwest
Attn: Mrs. Amy Burt, Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA. 98315-1101
Phone: 360-396-0924

Enclosed are additional comments on the GOA Draft EIS/OEIS to be included with my oral comments on January 7, 2010.

I found the DEIS to be completely ***inadequate and lacking*** in the Navy's analysis of mid-frequency active sonar impacts to humans, fish and marine life (endangered North Pacific right whales e.g.) in, or near the GOA TMAA- including inland/overland areas which could potentially be affected by the Navy, Air Force and Army joint training exercises. The Navy seems to be focusing mainly on mid-frequency active sonar use in the DEIS, but there are other sonar frequencies that could be just as hazardous to marine life (and humans), such as low-frequency (LF) and extremely –low frequency (ELF) transmissions, which the Navy uses on a regular basis in various areas. If the Navy is also proposing the use of LF and ELF in the GOA TMAA or over land area, that information needs to be included in the FEIS along with the hazardous transmission effects on marine/life-mammals and humans. Also, it states in the DEIS that the Navy does not know the hazards to birds from mid-frequency active sonar at long ranges. What about the risks to humans from long range MFA sonar? Taking into consideration all of the scientific research and studies that have been done by Navy scientists and others, I suspect the hazards are known but the Navy did not want to list them in the DEIS. The hazards to humans, birds, mammals and sea life needs to be included in the FEIS/OEIS.

The GOA DEIS is mainly focused on the use of mid-frequency active sonar and some evaluations and information was omitted in the draft which should have been included for public comment. **Section 3.14-Public Safety and Section 3.14-7-Aircraft Overflights** in the GOA DEIS *very briefly* mentions potential risks to the public from ship or aircraft electromagnetic transmissions. However, in a October 22, 2008 Elmendorf Air Force-Alaska briefing by Major Rob Peck, Airspace & Range Operations Team Chief, 611 AOC Combat Operations Division, he stated that the GOA EIS is mainly a subsurface evaluation and that although the Navy was looking at airspace, there would be no airspace proposal or rulemaking associated with the EIS. Why was an airspace evaluation not done for warfare training exercises?

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I am requesting that a ***Supplemental GOA DEIS*** be done as soon as possible, so that the public has time to comment on it, even if it means a delay in releasing the FEIS. Since the Navy, Air Force and Army are cooperating and doing combat training exercises together in the GOA and elsewhere in Alaska, the *Supplemental* GOA DEIS should include all air training exercise locations, military training routes (MTR), including the two new ones which are being proposed to be added this year, all radars/sensors which will participating in future combat exercises in or near the GOA or over-land areas, including their transmission, frequency and power levels. Some examples: (a) Sea-based X-band radar (b)Cordova HAARP substation (c)Juneau AN/TPY-2 (Transportable X-band Radar) (d)Shemya radar (e)HAARP in Gakona (f) Kodiak Dual-use High-power Microwave (g) King Salmon Microwave (h)Airborne Laser Plane. Some of these sensors/radars have transmission power levels which pose a health risk to humans and animals alike. The Sea-based X-Band will be coming under the jurisdiction of the Navy later this year (MDA spokesman Richard Lehner) and if the Navy is proposing to bring the radar to Alaska for home-porting or participate in future GOA training exercises, this information also needs to be included in a GOA Supplemental DEIS as the radar's transmission power levels are extremely hazardous to humans, birds and wildlife.

The Navy assumes there will be no significant impacts to any marine life in the GOA TMAA but has no documentation in the DEIS to back up its conclusion. Very relevant 2009 Navy and Air Force documentation which *should* have been referenced and included in the GOA DEIS for public comments but is lacking, is the **May 2009 'Northern Edge Joint Training Exercise 2009' Final EA/OEA** (Elmendorf Air Force document) and the Naval Postgraduate School funded **'Cruise Report for the April 2009 Gulf of Alaska Line-Transect Survey (GOALS) in the Navy Training Exercise Area' (June 2009)**, in which scientists (including some Navy), on the NOAA ship Oscar Dyson documented marine mammal species and biological resources that would be potentially affected by Navy GOA training exercises.

Information contained in the Elmendorf Air Force document, determined that there are 37 Endangered Species Act (ESA)-listed species that potentially occur within or near the GOA Exercise Area, including 28 fish species and 7 marine mammals. **Section 3.4.1.2.3-Conclusions on Effects of Sound on Fish** in the Elmendorf AF document stated: "The data obtained to date on effects of sound on fish are very limited both in terms of number of well-controlled studies and in number of species tested. Moreover, there are significant limits in the range of data available for any particular type of sound source. Finally, most of the data currently available has little to do with actual behavior of fish in response to sound in their normal environment. There is also almost nothing known about stress effects of any kind(s) of sound on fish." The document also states that aside from a few field studies, there are no data on the most critical questions regarding behavior effects of fish and that the more critical issue is the effect of human-generated sound on the behavior of wild animals.

The Navy concedes in the **GOA DEIS/OEIS** that the effects on fish could include direct physical injury including potential death from mid-frequency active sonar, and since the GOA is a major commercial fishing area, the Navy, Air Force and Army should refrain

from using mid-frequency active sonar or any other sonar (LFA, ELF) which has potential to kill fish, marine life or animals, and it should go without saying--the potential risks to humans. Low Frequency Active (LFA) sonar has also been known to kill fish. What exactly are the Navy's Shutdown Procedures for Schools of Fish in the GOA? That is, if Schools of Fish can be detected at all.

Another concern of the Navy's use of MFA sonar (or LFA sonar) is the fact that more than 95% of the seabirds breeding in the Continental United States nest in colonies in the Gulf of Alaska and Bering and Chukchi Seas (1992 US Fish and Wildlife Service). Approximately 60 million birds of 40 species breed in the Gulf of Alaska, plus another 50 million visit the area during the summer. According to the U.S. Geological Survey Department, some seabird populations damaged by the EXXON Valdez oil spill have not recovered. In fact, as a whole, the Gulf of Alaska has not recovered from the oil spill. It is unacceptable and unnecessary for the Navy to put further contaminations in the GOA waters and stressors on marine life and birds.

The Navy's GOA TMMA boundary line extends beyond the Aleutian Trench. The DEIS did not address what activities would take place in the trench or sonar impacts to sea life living in the trench, so this information needs to be included in the FEIS.

From the information given in the DEIS, there are no environmental benefits from GOA warfare testing. Rather the opposite is true-- the Navy's presence and activities pose potential environmental risks, especially to the endangered and threatened species found in or along the Gulf of Alaska coastline. These species have no tolerance for additional risks factors. The Navy has not proven that it can ensure the protection of marine mammals, marine life and birds in the GOA. Nor can it guarantee the safety to humans from mid-frequency transmissions.

According to a 2008 National Oceanic and Atmospheric Association (NOAA) report, increasing evidence suggests that exposure to intense underwater sound in some settings may cause certain marine mammals to strand and ultimately die. Some of these strandings are associated with mid-frequency active (MFA) military sonar."

According to recently released NATO documents, low frequency active (LFA) sonar has been used as high as 240 decibels, which is considered to be millions of times higher than the level that causes damage to humans and animals. The Navy has tested its LFA sonar on divers in the 120 to 160 decibel range, which resulted in hospitalization of the subjects. The Navy has experimented with its sonar on humpback and blue whales around Hawaii and the above levels are enough to cause permanent damage and death even for short periods of exposure. In Navy training exercises off the Bahamas, low frequency sonar levels of up to 235 decibels was used. Decibels in the 120 to 150 range caused the whales to abandon the area.

In June 2004, six beaked whales stranded in Alaska after active sonar testing during the Navy's Northern Edge exercises in the GOA. Information is limited on this event and did not come from NOAA or the Navy but from legal discovery.

Whether or not it had anything to with the Navy's 2009 summer Northern Edge Exercises in the GOA, a 2-year old humpback whale carcass was found washed ashore on a Kodiak Island beach on August 19. It was presumed to have been dead for approximately 4 weeks, but it's possible it could have been longer. Coincidentally, Northern Edge Exercise in the GOA took place from June 15-27. The 'Red Flag Alaska' exercise (jamming frequencies) was going on from July 27-August 7. If there were any over flight exercises near the GOA, certain air activity using various transmission/ frequencies may also have interfered with the whale, as some transmissions can reach long distances.

Section 3.6.1.3-Subsistence in the previously noted **Elmendorf AF 'Northern Edge Training Exercise'** document, it states that a number of communities that could potentially be affected by air activities are either partly or entirely dependent on subsistence activities and that because of the dependence of many Alaskans on subsistence activities, low-level military overflights and their potential impact on wildlife are a particular concern. Since there was no detailed information given in the GOA DEIS/OEIS, exactly what communities (coastal or inland) has the potential to be affected by air or ship warfare activities? List them in the FEIS.

As of January 5, 2009 (Federal Register), the National Marine Fisheries Service is adjusting the total allowable catch (TAC) amounts for the Gulf of Alaska Pollock and Pacific Cod fisheries. **(Fisheries of the Exclusive Economic Zone off Alaska; Inseason Adjustment to the 2009 Gulf of Alaska Pollock and Pacific cod Total Allowable Catch Amounts.)** The reason for this adjustment is because the endangered Steller sea lions occur in the same location as the Pollock and cod fisheries and cod and Pollock are the primary prey species source for the Steller sea lions in the GOA. The seasonal apportionment of Pollock and Pacific cod harvest is necessary to ensure the ground fish fisheries are not likely to cause jeopardy of extinction or adverse modification of critical habitat for Steller sea lions. This decision by NMFS will no doubt affect commercial fishermen in the GOA but is necessary to help with the Steller sea lions survival.

Additionally, Steller sea lions lives are being jeopardized by Killer whales in the Eastern GOA (Alaska Sea Life Conservation Science Center). If restrictions are being placed on Alaska fishermen, it is only fair that restrictions also be placed on the Navy, Air Force and Army by not allowing *any warfare training exercises in the Gulf of Alaska.* The Navy has other long-time training areas such as Point Mugu off the California coast and does not need to continually impact other environmentally sensitive areas for training exercises; nor should the Navy be doing military exercises that are likely to cause jeopardy of extinction or adverse modification of critical habitat for Steller sea lions or any other endangered species. The Navy has already received a Permit of Authorization from National Marine Fisheries Service (NMFS) to incidentally take ***2 million*** marine mammals per year for the next 5 years during its training exercises in Hawaii, the West Coast, Gulf of Mexico and the entire East Coast. Currently the Navy is proposing to do training exercises off of Guam.

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According to Sheila Murray, Navy Public Relations Officer, the Navy already is conducting warfare testing programs in various U.S. locations and within the last two years has issued almost identical environmental impact statements for Warfare Training Range Complexes in the Mariana Islands, the Hawaiian Islands, Jacksonville Florida, Cherry Point, North Carolina, Southern California, and now the Navy is proclaiming that the Gulf of Alaska is the best location for realistic training exercises. The Navy has a detrimental affect on marine life wherever it goes, and then does not want to accept responsibility for its actions. The Navy should be doing its part to protect and support federally threatened and endangered species in the Gulf of Alaska, Bering Sea, the Aleutian Chain and other geographic locations, rather than applying for federal exemptions to the Marine Mammal Protection Act and Bird Migratory Act, which it is consistently doing. Also, the Navy should adhere to and be in compliance with the Alaska Coastal Zone Management Plan when Navy ships and submarines are in Alaska waters.

Information contained in the previously mentioned Navy's **GOALS** document for the GOA survey, stated that although marine mammals are present year-round in the GOA, the greatest number of animals occurs during the spring and summer. The humpback, fin and possibly the right whales, feed in the outer continental shelf and slope waters during the summer into fall, while blue, sei and sperm whale species are thought to be more pelagic (Berzin and Rovnin 1966, Rice 1974). In 1980 a survey conducted and described by Rice and Wolman 1982, it was determined that the populations of all great whales in the GOA had been severely depleted. Since that time some of these species have shown signs of recovery; however, only the eastern North Pacific gray whale has experienced a complete population recovery (Rough *et al.* 2005).

The Navy's **GOALS** project identified fin, humpback, gray, minke, and killer whales. Dall's and harbor porpoise, Pacific white-sided dolphins and Steller sea lions, harbor seals and sea otters in the GOA. There were also 36 sightings (46 individuals) of unidentified large whales, dolphins, and pennipeds.
It needs to be noted that scientist observers on the Oscar Dyson NOAA ship had to use the towed acoustic array to collect vocalizations from all acoustically active cetaceans at times when no visual survey was possible due to high seas and winds or darkness. Under these types of weather conditions it would also be impossible for ship observers to keep visual track of whales and marine life in the GOA during Navy/Air Force, Army training exercises, which could then lead to the Navy having to use potentially harmful/life-threatening Low-frequency active (LFA) sonar in an attempt to locate marine life.

In the **GOA DEIS/OEIS,** the Navy believes that the impacts of active sonar on marine mammals, turtles and birds can be decreased by using on-ship 'spotters' with high-powered binoculars, aircraft spotters, and sonar technicians, but the Navy doesn't give any detailed information on the difficulty of spotting whales at any great distance. Many whales spend more time diving than they do at the surface. Biologists have said that the Navy's abilities to spot these whales any further than 1 kilometer in more than slight winds is 'zero'.

GOA DEIS- Table 3.14-1-Training Activities Affecting Public Safety
This section lists (1) Chaff (2) Anti-Air Warfare (AAW) Surface to Air Missile Exercise (3) EC Exercises (4) Counter Targeting Exercises
There should have been more detailed information listed on the hazards of these activities to the public and the information needs to be included in the FEIS. Chaff has caused problems in the past from Navy activities. As an example, in 1985 the Federal Aviation Administration (FAA) tracked and timed a chaff-cloud path that correlated with a Navy exercise which caused a large power outage in San Diego. The Navy paid the electric company $49,000 in damages caused by the Navy's dropping of chaff, which is made up of hair-fine particles of aluminum and fiberglass.

In a September 22, 1998 United States General Accounting Office National Security and International Affairs Division-Department of Defense report on Chaff, the report identified some unintended side effects of chaff. Chaff (a) can affect safety by interfering with air traffic control radar (b) can affect weather radar observations and the operations of friendly radar systems (c) has been reported to cause power outages and damage electrical equipment (d) has the potential chance of collecting in reservoirs and causing chemical changes that may affect water and species that use it.

Using chaff in the GOA or inland areas could have a potential life-threatening effect on marine life/ wildlife and possibly pose a health hazard risk to humans who might possibly come into contact with chaff in any situation (inhaling the aluminum/fiberglass particles or drinking them in their water supply e.g.).

Chaff can not be dispensed if prevailing winds will carry the chaff into FAA air traffic control areas or into designated high and low altitude air routes (**Standard Electronic Attack Clearance Request For Ranges'- Nov. 2002 White Sands Missile Range Army Manual**). In spite of the Navy having knowledge of chaff hazards, the Navy and Air Force continues using it in warfare training exercises and are its leading users.

Aside from the previously mentioned hazards from chaff use, another major concern is any potential risks to the electrical equipment of small or commercial aircraft in Alaska's heavily-used airspace, possibly causing the engines to fail. Rather than jeopardize the safety of humans and marine/wildlife, the use of chaff should be permanently discontinued by the Navy, Air Force and Army.

The GOA DEIS did not state if Depleted Uranium or White or Red Phosphorus use is being proposed for use in the GOA or inland areas. Include this information in the FEIS. The deposition of washout of White Phosphorus, especially in water bodies may create exposure risks to resident fish, invertebrates and waterfowl, even if the resultant White Phosphorus concentrations are in the low ppb range (**Berkowitz et.al 1981**)).
White Phosphorus is highly toxic to both experimental animals and man and is highly toxic to aquatic animals ('**Mammalian Toxicology and Toxicity to Aquatic Organism of White phosphorus and Phossy Water'** by Authors Dickinson Burrows; Jack C. Dacre: AWARE INC. Nashville TN).

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A map in the GOA DEIS **(Page 2-4)** shows Kodiak Island within a large 'restricted area' (outlined in red). Since the DEIS refers to 'activity outside the training area', but does not give further details, is Kodiak Island being proposed as a future Military Training Route (MTR) or 'restricted area' as part of future GOA warfare training exercises? Considering the fact that the Kodiak Launch Complex has access to the 'Gulf of Alaska Maritime Exercise Area' and the Air Force and Army have used the launch complex for their missile tests in past years, then it is reasonable to assume that the Navy would want to include Kodiak Island in future GOA training exercises, if a missile(s) were to be launched from the launch complex, tracked and intercepted/destroyed by whatever means during a training exercise. If Kodiak is going to be a part of future GOA warfare training exercises, the information needs to be included in the FEIS and shown on the included Alaska Military Airspace map(s).

Section 3.14-Public Safety states the public could be at risk from ship and aircraft activities and from the emissions of acoustic and electromagnetic energy (e.g. sonar and radar), but no specifics are given as to what radar or sonar systems. This needs to be discussed in further detail in the FEIS. Which radars/sensors will be transmitting into air space as part of warfare training exercises? The DEIS mentioned lasers, radio frequency and particle beam weapons, but no detailed information. Also mentioned but not discussed was 'new weapon systems'. In the FEIS list the weapon systems, their locations, maximum power levels, and transmission hazards to the public.

Through the University of Alaska-Fairbanks, the Navy funds the Kodiak High Power Microwave Array (located in Chiniak). The microwave fits into the category of what the Navy calls an 'Electromagnetic Warfare Weapon' System (the transmission power levels having the ability to interrupt the electronics on a plane or missile, causing them to "stop dead in their tracks", according to Department of Defense documents). The microwave antenna field has been upgraded since the radar was first installed and the sensors operate individually in various directions and frequencies and is a substation of the Navy's HAARP facility in Gakona. If the Navy is proposing to use the Kodiak microwave in future warfare training exercises, then it needs to be included in the FEIS along with potential transmitting hazards to the public, since many small/commercial aircraft use the airspace around Kodiak Island and also the airspace between Kodiak and other Alaska communities.

The Navy stated in the GOA DEIS that the Gulf of Alaska was the best place for the Navy, Air Force and Army to do their combined Electronic Combat training exercises. That is a fallacy because the **Nellis Range Complex-Nellis Air Force Range** in Nevada supports Department of Defense and Department of Energy '*Advanced Electronic Combat*' training and testing. Therefore, no Electronic Combat Exercises need to be tested in the Gulf of Alaska or inland areas.

Finally, the 'No Action Alternative' is not a *true* alternative because if the public chooses that first alternative, the Navy will continue doing Gulf of Alaska activities at the current levels. In the Elmendorf 'Final EA/OEA-Northern Edge Joint Training Exercise' (Proposed Action and Alternatives), five alternatives were evaluated and under the 'No

Action Alternative', joint training exercises in the Gulf of Alaska would *not* be conducted. The GOA DEIS should also have included a 'true' No Action Alternative which would have discontinued Gulf of Alaska training exercises, as the 'No Action Alternative' also poses environmental hazards and risks. Rather than having to choose an Alternative that is really *NOT* an option, I am requesting that the Navy discontinue its environmentally damaging presence in the Gulf of Alaska.

Carolyn Heitman

Carolyn Heitman

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I.1.15 ROBERTA HIGHLAND AND ROBERT ARCHIBOLD

United States Navy

Public Hearing Comment Form

Gulf of Alaska Navy Training Activities
Draft Environmental Impact Statement/
Overseas Environmental Impact Statement

Please record your comments on this form to let the U.S. Navy know what concerns and comments you have on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). You may submit your comments by:

1) Depositing this form at the Comment Table before you leave tonight.
2) Submitting your comments via the project Web site at **www.GulfofAlaskaNavyEIS.com**
3) Mailing this form to:
Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt - Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

☒ *Please check the box if you would like to receive a CD copy of the Final EIS/OEIS. Provide your mailing address below.*

All comments must be received or postmarked no later than January 25, 2010, to be considered in the Final EIS/OEIS.

Name: Roberta Highland + Robert Archibold

Organization/Affiliation: _____

Address:* P.O. Box 2460

City, State, Zip Code: Homer, AK 99603

Comments: We are very concerned at the proposed of expanding Navy training activities (NTA's) in the Gulf of AK. We oppose any expansion of these activities. However, we actually oppose any NTA's in this richly biodiverse area. The NTA's will pollute + cause disturbance to many species of mammals + fish.

We cannot think of any Alaskan H20's that are already so protected; except for Cook Inlet which has already been sacrificed to irresponsible development + a Critical Habitat is presently being considered; that NTA's would not adversely affect.

We did not know of NTA's already occurring

Visit www.GulfofAlaskaNavyEIS.com for project information.

*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

in this area + were shocked to discover they had been going on for 10 yrs - especially in May + June, which is the worst time frame for any such activities. However, as you heard at the public hearing, there is no "good" time for the Whales.

Active Sonar testing has been well documented to be extremely adverse to mammals, esp. whales + may possibly affect the inchedible system fish use to return to "whence they came."

Humans have to do a better job of respecting our precious oceans + we have / have concerns about ocean acidification. Please see the film "Sea Change"

We understand the need for the NTA's, though it is a sad state of affairs - but reality is harsh. The Navy is in a tough position when looking for H20's to practice NTA's. The use of any under H20 explosives over the continental shelf could have dire consequences for any migratory mammals + fish, thus we reiterate — we are opposed to any increase in NTA's + any activities of this nature in this rich body of H20.

Sincerely,
Roberta Highland + mom Richard

P.S. Consider using the 4E's for decision Making: Economy, Environment, Energy, Ethics

I.1.16 BOBBIE IVANOFF

United States Navy

Public Hearing Comment Form

Gulf of Alaska Navy Training Activities
Draft Environmental Impact Statement/
Overseas Environmental Impact Statement

Please record your comments on this form to let the U.S. Navy know what concerns and comments you have on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). You may submit your comments by:

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3) Mailing this form to:

Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt – Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

☐ *Please check the box if you would like to receive a CD copy of the Final EIS/OEIS. Provide your mailing address below.*

All comments must be received or postmarked no later than January 25, 2010, to be considered in the Final EIS/OEIS.

Name: Bobbie Ivanoff

Organization/Affiliation:

Address:* Box 2394

City, State, Zip Code: Kodiak AK 99615

Comments: LOCATION OF
It is clear that the current proposed Temporary Maritime Activities Area is directly in the path of migrating whales. Also ~~the~~ sonar is well known to negatively affect whales, dolphins.
Why does alternate plans include moving - redirecting the Activity area away from / especially the path of Migrating whales!

Visit www.GulfofAlaskaNavyEIS.com for project information.

*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

I.1.17 KACHEMAK BAY CONSERVATION SOCIETY

Naval Facilities Engineering Command Northwest
Attn: Mrs. Amy Burt, Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

January 25, 2010

The Kachemak Bay Conservation Society (KBCS) requests that the public comment period be extended for the Proposed Gulf of Alaska Navy Training Project.

The community closest to the proposed training site was left out of the public hearings, although this community would be the most likely affected. Also, notification in the newspapers was insufficient in the small communities most affected, including Homer, Kodiak, and Cordova.

KBCS reluctantly supports the **No Action Alternative**. After careful review of the DEIS, KBCS concludes that the Navy has not provided sufficient evidence or support for their claims of minimal or no impacts in a multitude of aspects. KBCS also concludes that the Navy DEIS fails to consider or completely ignores impacts that would cause incredible harm to the health and well-being of Alaska's people, wildlife, and environment.

The proposed testing area is adjacent to the eastern Kenai Peninsula and just south of the Prince William Sound. These areas are renowned tourist and fishing destinations because they are some of the world's biologically richest. The shallow shelf that skirts the edges of the GOA is highly productive, creating an abundance of prey foods for marine life large and small. Choosing to conduct testing in this area threatens the short and long-term health of the wildlife, people, and ocean in this region.

Socioeconomic Impacts:

1) In the discussion of impacts to both Socioeconomics and Fish, the Navy does not provide research into effects of its proposed activities on the types of fish that are harvested commercially (sport or commercial fishing) in this region. The DEIS makes broad discussions of generalist and specialist types of hearing among fish, and makes the claim that "most" fish are generalists. The DEIS does not state whether halibut, herring, rockfish, or salmon are generalists or specialists. Thus, they cannot make the claim of "no significant impacts."

   The DEIS does state that fish are known worldwide to avoid areas where sonar testing is being conducted. Thus, from the DEIS's own statements in this document one could reasonably conclude that the fish in the testing area would in fact avoid the area. As a result, there would be impacts on the fish.

   Given the likelihood of impacts on the fish, above, then one could reasonably conclude that the commercial fishers fishing in the proposed test area may be affected. Given that commercial fishing for some species is set to occur only at prescribed times according to federal and state laws (called "openers"), then the impacts from the testing could cause great harm to fishers who were unable to find fish or fish during times with Navy testing overlapped an opener.

   In addition, sonar testing, according to the DEIS, can cause harm to fish, thus, any harm to the fish that reduced the numbers of these fish due to disorientation, physical harm, or other aspects, could cause a reduction in the harvest of fish for that season. This would be a socioeconomic harm.

2) The DEIS also does not take into consideration the socioeconomic impacts for the tourist industry for the entire area, Seward to Homer, that are likely with the proposed alternatives. The DEIS states that for Alternative 2 the NMFS "takes" would likely be 425,551 marine mammals, much of those dolphin. In Alternative 1, this number is 215,519.

   The number of takes predicted by the DEIS is likely to cause a drop in the number of marine mammals in the area. Given that one of the primary economic businesses in the area, Seward, is whale watching, it is likely that any reduction in these animals will cause harm to the businesses that depend on the marine life in the area. Notably, the proposed testing area is immediately adjacent to the Kenai Fjords National Park, a Park that draws nearly 300,000 people every year.

Marine Mammal Impacts:

3) There is much discrepancy between how the Navy DEIS evaluates noise impacts and how other reputable marine mammal scientists evaluate these impacts. There are numerous instances of impacts on whales and dolphins by sonar testing.

   Here is a list compiled by other environmental organizations:

- **January 2006** At least four beaked whales strand in the Gulf of Almeria, Spain, while sonar exercises take place offshore.
- **January 2005** At least 34 whales of three species strand along the Outer Banks of North Carolina as Navy sonar training goes on offshore.
- **July 2004** Four beaked whales strand during naval exercises near the Canary Islands.
- **July 2004** Approximately 200 melon-headed whales crowd into the shallow waters of Hanalei Bay in Hawaii as a large Navy sonar exercise takes place nearby. Rescuers succeed in directing all but one of the whales back out to sea.
- **June 2004** As many as six beaked whales strand during a Navy sonar training exercise off Alaska.
- **May 2003** As many as 11 harbor porpoises beach along the shores of the Haro Strait, Washington State, as the USS Shoup tests its mid-frequency sonar system.
- **September 2002** At least 14 beaked whales from three different species strand in the Canary Islands during an anti-submarine warfare exercise in the area. Four additional beaked whales strand over the next several days.
- **May 2000** Three beaked whales strand on the beaches of Madeira during NATO naval exercises near shore.
- **October 1999** Four beaked whales strand in the U.S. Virgin Islands during Navy maneuvers offshore.
- **October 1997** At least nine Cuvier's beaked whales strand in the Ionian Sea, with military activity reported in the area.
- **May 1996** Twelve Cuvier's beaked whales strand on the west coast of Greece as NATO ships sweep the area with low- and mid-frequency active sonar.
- **October 1989** At least 20 whales of three species strand during naval exercises near the Canary Islands.
- **December 1991** Two Cuvier's beaked whales strand during naval exercises near the Canary Islands.

These issues should be addressed honestly and with a goal of conducting legitimate, unbiased research. Creating science that simply downplays the real effects of potentially lethal activities is morally imprudent and does not give the U.S. citizen the right to an educated choice.

4) The DEIS does not address potential impacts to marine mammals that feed primarily on the seafloor. Gray whales could easily scoop up spent debris and pollution from the proposed testing activities.

Toxicity

5) There will be an inordinate amount of toxins dumped into a region known worldwide as being particularly clean. This could have impacts on the health of all life in the ocean and economic impacts for commercial and sports fishers.

Cumulative Effects

6) The DEIS does not take into consideration elements of climate change that directly effect the proposed tests. In particular, the new scientific evidence that is showing that ph changes (acidification) of the oceans increases the transfer of sound through the ocean.

7) There is a profound lack of attention to the cumulative effects of all the toxins that the testing will discharge into the water.

8) The DEIS fails to take into consideration the impacts of the Exxon Valdez Oil Spill, particularly in regards to salmon returns and otters.

Mitigation

9) The proposed mitigation measures would fail to protect any marine life. It is wholly unreasonable to expect anyone aboard a ship to spot a whale that is more than a few yards away from the ship. The Gulf of Alaska is known to have frequent high seas, winds, and rain that would make it nearly impossible for scouts to observe whales. It is ludicrous that this mitigation measure is even proposed. The Navy was sued by NRDC over these measures, with the court finding stating that the measures were "woefully inadequate and ineffectual." According to research, only 5% of marine mammals are able to be spotted this way.

10) The DEIS eliminates important mitigation measures they were required to use elsewhere. A region as biologically rich and as economically dependent on marine life as the proposed testing region warrants much more diligent attempts at reasonable and functional mitigation measures.

11) Comparing impacts from the southern ocean region near San Diego, as was done by a representative at a public comment period, with the GOA is not logical. These are two very different ocean ecosystems. And, there is no viable commercial fishery in the region the Navy "usually" tests in, unlike the GOA.

Please reconsider your plans. Thank you for taking our comments.
Elise Wolf, KBCS

I.1.18 KACHEMAK BAY ORGANIZATION

United States Navy

Public Hearing Comment Form

Gulf of Alaska Navy Training Activities
Draft Environmental Impact Statement/
Overseas Environmental Impact Statement

Please record your comments on this form to let the U.S. Navy know what concerns and comments you have on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). You may submit your comments by:

1) Depositing this form at the Comment Table before you leave tonight.
2) Submitting your comments via the project Web site at **www.GulfofAlaskaNavyEIS.com**
3) Mailing this form to:
Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt - Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

☐ *Please check the box if you would like to receive a CD copy of the Final EIS/OEIS. Provide your mailing address below.*

All comments must be received or postmarked no later than January 25, 2010, to be considered in the Final EIS/OEIS.

Name: Roberta Highland

Organization/Affiliation: Kachemak Bay Organization

Address:* P.O. Box 2460

City, State, Zip Code: Homer, AK 99603

Comments:

Please include a question + answer ½° to 1° ~~as~~ before the public meeting / Comment time - so our questions can be answered as a group + everyone can hear the answer + learn. In the future.

Visit www.GulfofAlaskaNavyEIS.com for project information.

*Provide your mailing address to receive future notces about the Gulf of Alaska Navy Training Activities EIS/OEIS.

I.1.19 RYAN KINGSBERY

January 19, 2010

Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101
Attn: Amy Burt, Gulf of Alaska EIS/OEIS Project Manager

Dear Amy Burt,

I am writing to voice my concern with two specific aspects of the recently released Gulf of Alaska Navy Training Activities Draft EIS/OEIS (December 2009). My personal background is weighted in northern fur seal (*Callorhinus ursinus*) population biology and marine debris entanglement, particularly in the Bering Sea/Pribilof Island region. I am currently pursuing an M.S. in Environmental Science at Alaska Pacific University in Anchorage, Alaska.

My first concern takes issue with the listing of the northern fur seal population trend as "increasing" as is stated on page 328 in Table 3.8-1 and indicated at the bottom of page 386 under section 3.8.5.4 Northern Fur Seal: Population Size and Trends. According to the Alaska Fisheries Science Center: National Marine Mammal Laboratory (NMML) 2008 Quarterly Report, pup production in the Pribilof Islands has declined at an annual rate of 5.2% since 1998.[1] Towel et al. (2006) also notes that between 1998 and 2004 pup production on the Pribilofs has declined by 6% each year.[2] I therefore contend that the listing of the northern fur seal population trend as increasing as is stated in the EIS/OEIS, is not accurate and runs counter to current population studies.

Secondly, I agree with public concerns outlined in Table 1.1: Public Scoping Comment Summary on page 69, more specifically the effects of harmful levels of noise on whales particularly both species of beaked whales (*Berardius bairdii, Ziphius cavirostris*) and endangered species such as the North Pacific Right Whale (*Eubalaena robustus)*. I disagree with the statement found on page 362 under section 3.8.4.1: Impacts of Human Activity, that says there is new evidence that beaked whales are not sensitive to Navy sonar. There is sufficient evidence in the form of well-documented cases that link certain sonar frequency levels with beaked whale strandings.[3] Also, on page 349 under section 3.8.3.4: Acoustics there is mention of adverse behavioral changes observed when Right Whales are submitted to noise levels between 133 and 148 dB, but beyond this there is no other research indicated. This species in particular is the most vulnerable whale present in the TMAA due to current population numbers and therefore I think it demands special attention. In summary, I think there needs to be more convincing research and additional mitigation that takes into account the sensitivity of the aforementioned species.

Thank you for allowing me to comment on this EIS/OEIS. I look forward to your response.

Sincerely,

Ryan Kingsbery

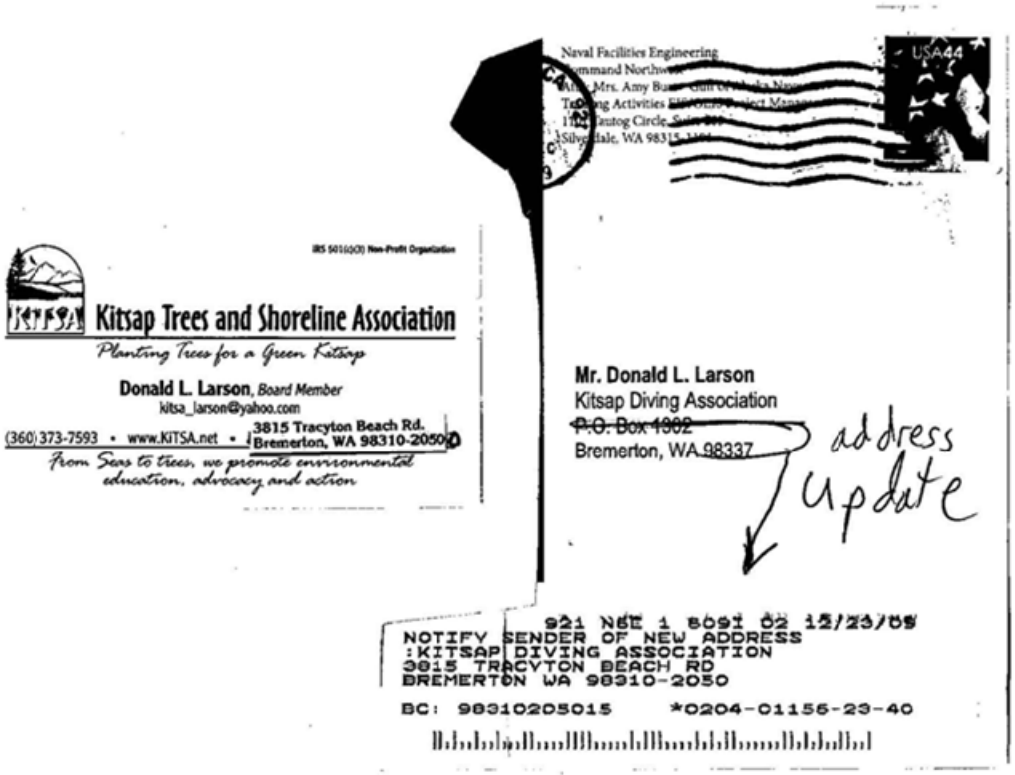
[1] Alaska Fisheries Science Center: National Marine Mammal Laboratory Quarterly Research Report (2008), PDF downloadable at http://www.afsc.noaa.gov/Quarterly/ond2008/tocNMML.htm, P.13 [website last accessed 1/18/10]

[2] Towell RG, Ream RR, York AE (2006) Decline in fur seal (Callorhinus ursinus) pup production on the Pribilof Islands. Mar Mamm Sci 22:486-491

[3] National Research Council (2003) Ocean Noise and Marine Mammals. The National Academies Press, Washington, D.C., accessed by way of University of Rhode Island, Office of Marine Programs, http://www.dosits.org/animals/effects/e1a-d.htm. [website last accessed 1/18/10]

Ryan Kingsbery 825 P Street, Anchorage, AK 99501 rkingsbery@alaskapacific.edu

I.1.20 KITSAP TREES AND SHORELINE ASSOCIATION



Naval Facilities Engineering
Mrs. Amy Bu
Activities
Silverdale, WA 98315

USA44

IRS 501(c)(3) Non-Profit Organization

Kitsap Trees and Shoreline Association
Planting Trees for a Green Kitsap

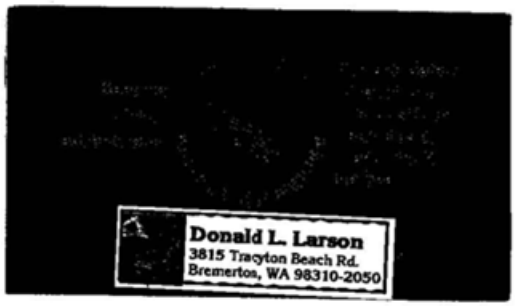
Donald L. Larson, *Board Member*
kitsa_larson@yahoo.com
(360) 373-7593 • www.KITSA.net • 3815 Tracyton Beach Rd. Bremerton, WA 98310-2050

From Seas to trees, we promote environmental education, advocacy and action

Mr. Donald L. Larson
Kitsap Diving Association
~~P.O. Box 4002~~
Bremerton, WA 98337

address update

921 NOT 1 8091 02 12/23/09
NOTIFY SENDER OF NEW ADDRESS
:KITSAP DIVING ASSOCIATION
3815 TRACYTON BEACH RD
BREMERTON WA 98310-2050
BC: 98310205015 *0204-01155-23-40



I.1.21 WHITNEY LOWE

The Navy has a history of poor environmental stewardship including dumping high volumes of garbage into the ocean as well as toxic materials from explosive ordinance. Consequently it is difficult to believe what they might say about being responsible with environmental impacts of their actions.

In these times of international terrorism it is easy to throw out the fear card and say all these training exercises are necessary to keep our country safe. Trumping up people's fears has routinely led to trading off the health and safety of human and other animal habitats because supposedly it was going to make us safer. At some point it would be great to think that we might learn that the answer to making us safer doesn't result from bigger and more powerfully destructive weapons, nor from destroying our surroundings in the pursuit of those weapons.

At the present moment, we have a situation of drastic concern with our worldwide fisheries and marine environment. A November 2006 article in the journal *Science* suggested there will be virtually nothing left to fish from the seas by the middle of the century if current trends of catastrophic fish populations declines continue. The primary culprits involve overfishing, pollution, and other environmental factors.

In the face of these issues it is totally irresponsible to increase military training which involves toxic dumping and tactics known to kill and injure marine life. We should be going to great lengths to do anything we can to not only mitigate our current practices that are causing that precipitous decline, but to reverse this trend. To engage further military exercises in this region that is extremely rich in sensitive marine life is a blunder of serious proportions and represents incredibly poor judgment.

Our children and descendants, in whose hands we leave this critically injured world, will be asking... What were they thinking?... We can't afford to participate in this process as it represents the epitome of irresponsibility and drastically poor judgment.

Whitney Lowe
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wlowe97@gmail.com
907-235-2348

I.1.22 MARINE MAMMAL COMMISSION

MARINE MAMMAL COMMISSION

27 January 2010

Ms. Amy Burt
Gulf of Alaska DEIS/OEIS Project Manager
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale WA 98315-1101

Dear Ms. Burt:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS) referenced in the Navy's 15 December 2009 *Federal Register* notice (74 Fed. Reg. 65761) regarding proposed activities in the Gulf of Alaska. On 22 April 2008 the Commission commented on the Navy's Notice of Intent to prepare an environmental impact statement for those activities. The recommendations and rationale that follow either reinforce or expand upon those earlier comments.

RECOMMENDATIONS

The Marine Mammal Commission recommends that the Navy—

- revise its DEIS to ensure that (1) all activities included under the no-action alternative have been evaluated, (2) the alternatives evaluated and presented to decision-makers and the public include a reduction in activity level, and (3) the scope of decision-making is not constrained unnecessarily;
- resolve inconsistencies, omissions, and errors in the DEIS and either reissue it or use some other mechanism to allow decision-makers and the public to review and respond to the revised information;
- withdraw the current section of the DEIS dealing with Cook Inlet beluga whales, conduct the essential analysis of effects on this endangered stock, and reissue at least that section of the amended DEIS;
- provide explicit and detailed descriptions of the measures that will be used to avoid risks to certain species or stocks of special concern (i.e., eastern population of North Pacific right whales, western population of Steller sea lions, AT1 pod of killer whales in and around Prince William Sound [although occasionally ranging more widely], sperm whales, humpback whales, fin whales, and sei whales);
- expand the description of marine mammal habitat use in the Gulf of Alaska by reviewing the considerable body of information on species-specific distribution and movement patterns obtained from whaling records, scientific research, and other sources over the past century;
- evaluate the anticipated effectiveness of monitoring and mitigation measures; and
- require vessel commanders to retain vessel logs and reports for a minimum of three years.

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www.mmc.gov

RATIONALE

The Commission offers the following rationale for its recommendations.

No-Action Alternative

The Marine Mammal Commission continues to believe that an action agency should use the "No-Action" alternative to represent continued activity at the same level only if those activities already have been evaluated in a previous environmental analysis. Further, a previous analysis may not be adequate for that purpose if the activities that were initially evaluated have since changed. To fulfill their purpose of fully informing decision-makers, environmental impact statements must include or at least reference evaluations of all the activities in the proposed alternatives, whether those activities are ongoing or new.

A hypothetical example may help explain the shortcomings of the Navy's current approach. If the Navy initiated activities in the Gulf of Alaska 10 years ago by conducting two exercises of one type each year, it should have completed an environmental analysis of the effects of those two exercises. If, over the past 10 years, the Navy increased its activities so that it now conducts five exercises of that type and three exercises of yet another type, then an environmental analysis based on historical data would be inadequate to describe the effects of all the Navy's current activities because the historical record does not in fact reflect the current level of activity. This undermines the intent of the National Environmental Policy Act.

The Marine Mammal Commission also continues to believe that it is inappropriate for the Navy to exclude alternatives that result in a reduction in its activities in the Gulf. By doing so, the Navy essentially limits the scope of decision-making because decision-makers are not presented with information about the consequences of possible reductions in training activities. Such an approach constrains rather than empowers decision-makers to make fully informed decisions and thereby undermines the intent of the National Environmental Policy Act.

For those reasons, the Marine Mammal Commission recommends that the Navy revise its DEIS to ensure that (1) all activities included under the no-action alternative have been evaluated, (2) the alternatives evaluated and presented to decision-makers and the public include a reduction in activity level, and (3) the scope of decision-making is not constrained unnecessarily.

Inconsistent Descriptions of the Alternatives and Other Errors

Certain inconsistencies, omissions, and errors in this DEIS are likely to misguide decision-makers and the public and therefore warrant attention. The following are four examples of such shortcomings.

- The description of the three alternatives on page E-1 does not match the more detailed descriptions on page ES-9 and in the body of the DEIS. In particular, the Portable Undersea

Training Range is included only in Alternative 2 on page E-1 but is included in Alternative 1 in all subsequent discussions.

- The DEIS does not provide an adequate description of SSQ-125 (Multi-Static Active Coherent or MAC), the replacement for the SSQ-110 non-explosive sound source. Although the specific source characteristics may be classified, sufficient unclassified information must be provided to permit verification in at least a general sense of the anticipated risk posed by what is obviously going to be a very loud and widely used source in Navy training.
- The DEIS does not describe the specifications for the Killer Tomato target simulator. Although it appears by inference to be some kind of smoke or optical beacon, the DEIS does not describe the device or its function or identify it with an official designation (e.g., Mk-85, TALD or LUU-2B/B) so that the reader is able to seek additional information from other resources.
- In the next to last paragraph of page 3.8-111, the DEIS includes what we believe is a typographical error in which the word *constructed* appears in place of the apparently intended word *constricted*.
- In the same paragraph, the DEIS cites speculation in Tyack (2009) that beaked whales may avoid all sounds equally. Indeed, this is just speculation on Tyack's part, and he identifies it as such. The Commission believes it is inappropriate and unreasonable to infer that sonars pose no greater risk than other sound sources when, in fact, the little evidence available on this subject indicates otherwise.

To ensure that decision-makers and the public are accurately informed about the activities proposed in this DEIS, the Marine Mammal Commission recommends that the Navy resolve inconsistencies, omissions, and errors in the DEIS and either reissue it or use some other mechanism to allow decision-makers and the public to review and respond to the revised information.

Cook Inlet Beluga Whales

The Navy excludes consideration of Cook Inlet beluga whales from analysis in the DEIS. It justifies this exclusion by citing a 1995 Air Force environmental impact statement as the appropriate document for analysis of this stock. However, the Air Force environmental impact statement does not contain an analysis of effects of aircraft noise on beluga whales in Cook Inlet and, even if it did, that analysis would be out of date. Since preparation of the 1995 statement, the Navy appears to have changed the number of aircraft and associated traffic patterns as part of an increase in joint activities with other armed forces, as noted in the current DEIS. Furthermore, since preparation of the 1995 statement, the Cook Inlet beluga whale stock has declined markedly to approximately 300 to 400 individuals, has been designated as depleted under the Marine Mammal Protection Act, and has been listed as endangered under the Endangered Species Act. Thus, neither the 1995 statement nor the DEIS under consideration provides adequate analysis of the potential effects of the proposed activities on this endangered beluga whale stock. The Marine Mammal Commission considers this a serious oversight and recommends that the Navy withdraw the current section of

the DEIS dealing with Cook Inlet beluga whales, conduct the essential analysis of effects on this endangered stock, and reissue at least that section of the amended DEIS.

Other Species or Stocks of Special Concern

As it did in its 22 April 2008 letter, the Marine Mammal Commission also recommends that the Navy provide explicit and detailed descriptions of the measures that will be used to avoid risks to certain species or stocks of special concern. These include the eastern population of North Pacific right whales, which has been reduced to fewer than 100 individuals and is vulnerable to disturbance and vessel strikes (based on data from the closely related North Atlantic right whale). Cook Inlet beluga whales were mentioned previously in this letter. Although outside the Navy's designated operating area, they are exposed to increased activity at Elmendorf Air Force Base and possibly other joint service exercises in Cook Inlet and coastal areas within the stock's range. Steller sea lions, AT1 killer whales in and around Prince William Sound (although occasionally ranging more widely), sperm whales, humpback whales, fin whales, and sei whales also were mentioned in our 22 April 2008 letter. The Commission concurs that sea otters are unlikely to enter the Navy training range area due to the distance from shore.

Habitat Analyses

With regard to marine mammals, the habitat analyses in the DEIS focus almost entirely on areas designated as critical habitat for those species that are listed as endangered or threatened under the Endangered Species Act. Such areas clearly are important and warrant extra protection, but they also are insufficient in two important respects. First, critical habitat for listed species often is poorly understood, so key habitat areas for those species may not be included. For example, critical habitat for the North Pacific right whale includes two areas, one in the southeastern Bering Sea and one off Kodiak Island in the Gulf of Alaska. The right whales that use these two areas are not thought to represent separate populations; rather, they likely move back and forth between the Gulf (and other areas of the North Pacific) and Bering Sea through certain important passes in the Aleutian Islands (e.g., Unimak, Akutan, Umnak, and Sequam Passes). These areas also may be vital to protect as they must funnel or concentrate the whales during their seasonal movements. Second, a number of species in the Gulf area are not listed under the Endangered Species Act but still use and depend on specific habitat. In fact, the records of marine mammal habitat use in the Gulf of Alaska are extensive, dating back to the 1800s. For example, northern fur seals appear to use and depend on offshore areas south of the Yakutat area. C. H. Townsend described the use of this "Fairweather Sealing Ground" and other important seal habitat in the late 1800s based on records of pelagic seal harvests. Both pinnipeds and cetaceans use the Gulf extensively. More recently, much of this information is being collected and archived and is available for management purposes. Products from the OBIS SEAMAP are available from a Web-based data archive, which also comes with a toolkit for analysis. In fact, the Navy notes on page 1-6 that the Gulf of Alaska is a complex system of shelf edges, canyons, seamounts, and freshwater intrusions, all features that are of great relevance and attractive to marine mammals and other critical ecosystem components. Although this statement generally is correct, a thorough review of existing data on marine mammal distribution and movements in the North Pacific would give the Navy much more insight into habitat use and

the kinds of measures that might be needed to protect that habitat. With that in mind, the Marine Mammal Commission recommends that the Navy expand the description of marine mammal habitat use in the Gulf of Alaska by reviewing the considerable body of information on species-specific distribution and movement patterns obtained from whaling records, scientific research, and other sources over the past century. The Commission recognizes that this represents a considerable amount of work, but we note that the thorough literature research already completed for the "Affected Species" portions of the DEIS will probably also provide most of the information needed to define and plot the typical habitats used by each species and then factor that information into an analysis of places of special concern.

Effectiveness of Proposed Mitigation Measures

The Marine Mammal Commission repeats its now frequent recommendation that the Navy evaluate the effectiveness of its monitoring and mitigation measures. Performance tests for monitoring and mitigation measures are both technically feasible and economically reasonable. Such tests could either strengthen the Navy's position that its existing measures are adequate or, more likely, point toward steps needed to improve them. Both outcomes would provide useful information for managers responsible for ensuring the protection of marine mammals and their habitat. The Navy subjects all tactical systems to performance evaluation and doing so with its environmental systems also is necessary for the Navy to meet its commitment to good environmental stewardship.

Retention of Vessel Logs and Records

The DEIS proposes (page 5-10) that logs and records relevant to marine mammal sightings and mitigation efforts, and other critical environmental data will be destroyed after 30 days. The Marine Mammal Commission believes that destruction of such records is entirely contrary to efforts by the Navy, the regulatory agencies (primarily the National Marine Fisheries Service), the Marine Mammal Commission, and all parties interested in better characterization of interactions between Navy operations and marine mammals. Navy activities pose a variety of risks to marine mammals including, but not limited to, those emanating from the introduction of noise (e.g., sonar), blasting (e.g., ship-shock trials, weapons testing and training), and ship strikes (e.g., especially those that involve endangered large whales). Records of Navy interactions with marine mammals are critical to characterizing those risks, evaluating the efficacy of monitoring methods, evaluating the utility of mitigation measures, and identifying alternatives for avoiding unnecessary risks. To understand the effects of Navy operations, investigators must be able to reconstruct the circumstances surrounding events such as those that occurred in Haro Strait in 2003, Haro Strait in 2004, and Hanalei Bay in 2004. Destruction of vital Navy records precludes such reconstruction and undermines efforts to identify solutions that allow the Navy to conduct its exercises while ensuring that marine mammals are protected. For that reason, and because investigation of marine mammal interactions can take several years, the Marine Mammal Commission recommends that the Navy require its vessel commanders to retain vessel logs and reports for a minimum of three years.

We hope that you find these recommendations and rationale helpful. Please contact us if you have any questions or wish to discuss them.

Sincerely,

Timothy J. Ragen

Timothy J. Ragen, Ph.D.
Executive Director

I.1.23 KATHERINE MCLAUGHLIN

To: Naval Facilities Engineering Command Northwest
Attention: Mrs. Amy Burt,
Gulf of Alaska Navy Training Activities EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

RE: Public Comment

DEPARTMENT OF DEFENSE
Department of the Navy

Notice of Public Hearings for the Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities

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Thank you for the opportunity to comment on this draft EIS by the Department of Defense. As an environmental educator, a humpback whale researcher who works with NOAA on abundance and behavior patterns of these unique cetaceans, and a board member for Prince William SoundKeeper, a citizen water quality advocacy organization for Prince William Sound, the proposed actions by the department of defense are a great concern for me over the potential and real harm that will take place upon marine mammals, and for the amount of environmental damage that may be caused to the marine environment in general with the amount and type of ordinance and activity listed in the request.

I believe the EIS submitted by the Navy is seriously flawed. It is my belief that the U.S. Navy can conduct its exercises while safeguarding the unique and precious ecosystem of the North Gulf of Alaska without jeopardizing the safety and security of our Country.

For clarity and conciseness, the concerns outlined below were prepared by the NRDC, but speak for me as to my own personal concerns as well. Please include these comments in the administrative record.

Sincerely, Katherine McLaughlin

Mrs. Katherine McLaughlin
Environmental Consultant
McLaughlin Environmental Services
PO Box 8043
Chenega Bay, AK 99574

*The Navy estimates an extraordinary amount of spent material will result from its Preferred Alternative (Alternative 2) in the GOA, including (1) a large increase in the weight of expended materials (352,000 lbs) and (2) 10,300 pounds of expended hazardous material. The Navy uses a quirky calculation to estimate that hazardous materials would account for approximately 1.2 lb per square nautical mile (assuming the materials are spread over

20% of the TMAA, and that ocean currents will rapidly disperse the expended materials, neither of which is a valid assumption).

*The Navy estimates that its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 425,000 marine mammal "takes" (behavioral impacts, harassment, injury, death) every year - that's over 2.125 million takes during the course of the Marine Mammal Protection Act permit it must seek from NOAA.

*In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the GOA.

*Nearly all of the mitigation measures that the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far-reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast-moving vessels.

*The Navy has not proposed to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife.

*For example, no protection areas are proposed for harbor porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the TMAA; for endangered humpback whales and blue whales, which gather to feed in the TMAA; for the critically endangered North Pacific right whale, who's critical habitat is directly adjacent to the TMAA; or for any other species or habitat.

With regard to our specific concerns/question, we obviously have huge concerns with the impacts of the Navy's proposed increase in training, including:

*The Navy does not properly analyze environmental impacts. For instance, it completely disregards the serious impacts its sonar training will have on the critically endangered North Pacific right whales, whose critical habitat is only 12 nautical miles from the TMAA or the endangered gray whales, which migrate through the TMAA.

*The Navy underestimates the number of marine mammals (and fish) that will be harassed, injured and killed because it simply does not have the density estimates needed in order to accurately make this determination. The National Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. See 40 C.F.R. § 1502.22(a). Here, the Navy failed to obtain data that is essential to its analysis. The Navy itself admits that it has no density estimates for endangered blue whales, North Pacific right whales, and sei whales. In addition, there are simply no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in the GOA. Despite the lack of survey/density data, the Navy simply estimates that only 1 blue whale, 1 North Pacific right whale and 4 sei whales may be harmed by its use of sonar because of the "rareness" of those whales. NEPA requires more. It requires these surveys to be completed and included in the impacts analysis.

*In addition, the Navy's acoustics impact analysis ignores scientific studies contrary to its interests and uses methodologies not supported by the scientific community. Thus, the thresholds it sets for permanent injury, temporary injury (hearing loss) and behavioral change (which we would argue are too high and thus completely underestimate the actual number of wildlife that will be impacted) are invalid as a matter of science. For instance, in setting its thresholds at 195 dB for harassment and temporary injury and 215 dB for permanent injury and death, the Navy ignores a 2004 study by Nowachek et al which found that right whales respond to mid-frequency sound below 140 dB (the sound caused them to stop eating and ascend rapidly to just below the surface, making them extremely vulnerable to ship strikes).

*The Navy's cumulative impacts analysis is inadequate. Chapter 4 of the DEIS simply lists projects that could have potential cumulative impacts on the Northwest Range without actually analyzing what those impacts will be.

*The Navy's alternative analysis is also inadequate. The Navy only presents three options - maintain the status quo, add more training, or add even more training. It does not consider - or blithely dismisses - any other alternatives, some employed by the Navy itself in other training exercises and ranges.

*Finally - and most critically - the Navy does not set forth adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual monitors. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." (For instance, studies show that visual monitoring only spots about 5% of marine mammals. Statistically, a 5% "success" rate clearly does not cut it.) The Navy's refusal to employ better mitigation measures is astounding, because it has used more protective measures during previous training. As NRDC discovered during previous litigation against the Navy (and as our recent settlement agreement has allowed us to make public), the Navy has adopted, during previous exercises, some of the same mitigation measures we have repeatedly beseeched it to employ and which it now claims it cannot employ. These measures include siting exercises beyond the continental shelf and Gulf Stream, relocating exercises out of important habitat and to avoid certain species, and using a technique called "simulated geography" to avoid canyons and near-shore areas on at least three of its major ranges. It also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time. Although in Chapter 5 of the DEIS the Navy goes to some pain to describe "alternative mitigation measures considered but eliminated" - primarily for "training effectiveness" reasons - its previous adoption of the exact same measures belies its argument. The Navy's claim that it cannot implement more protective mitigation measures is therefore completely disingenuous.

I.1.24 NATIONAL DATA BUOY CENTER

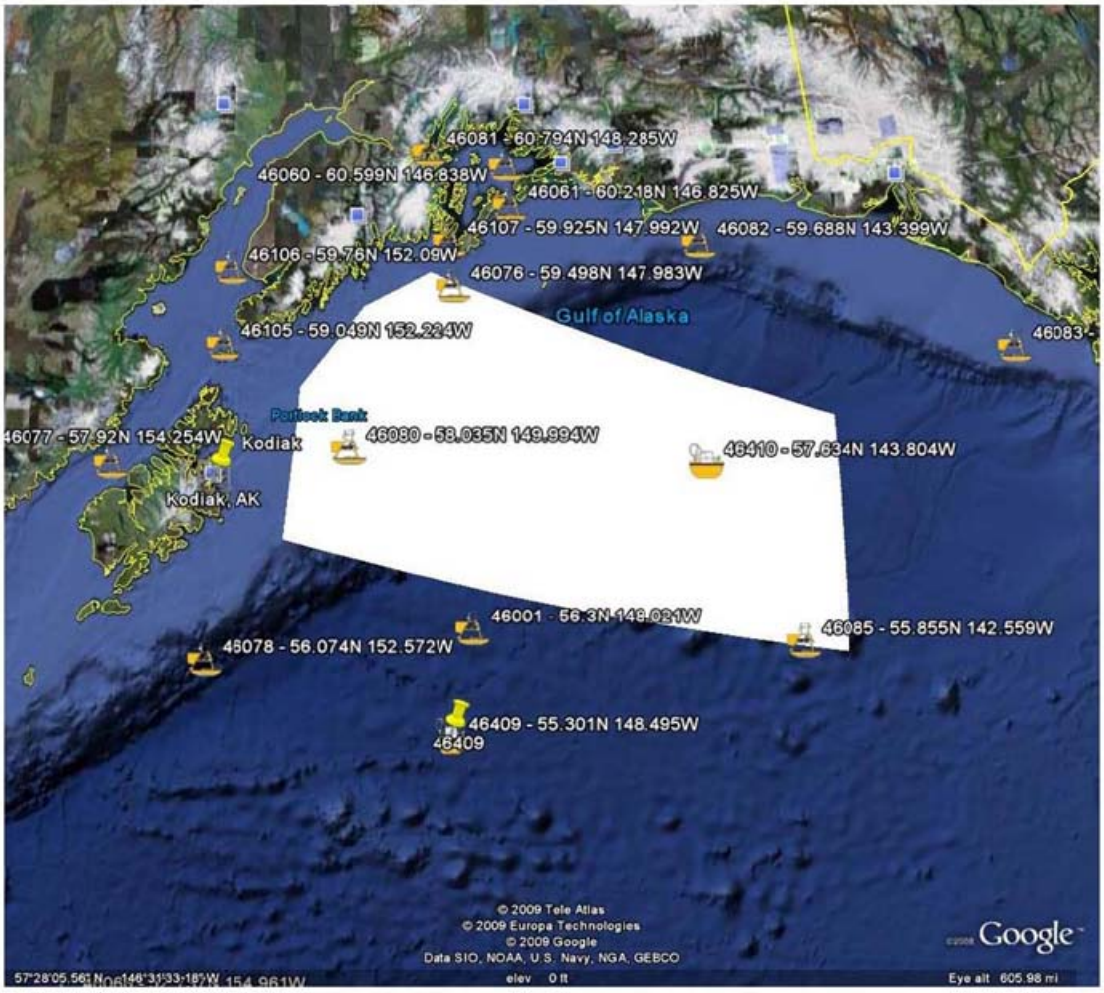
From: Craig Kohler
To: Burt, Amy E CIV NAVFAC NW, EV1
Cc: Amy.B.Cox@noaa.gov; Christian Meinig; Stephen Cucullu; Cheryl Hickey; Chung-Chu Teng
Subject: Re: Navy activities in GOA/DART
Date: Friday, January 22, 2010 8:25:32
Attachments: GOA Naval Exercise.pdf
Craig_Kohler.vcf

Graphic now attached...

Amy (Burt),
NDBC has identified the buoys/moorings that are potentially in the GOA exercise operating area. The attached graphic lists these stations, positions and watch circle radii that need to be avoided. Additional information is contained on our website (http://www.ndbc.noaa.gov/) but please don't hesitate to contact me if you have any questions.
Best regards,
Craig

Amy B. Cox wrote:
> Craig,
> We will include this information in our comments to the Navy. We are
> submitting informal comments this month as a cooperating agency on the
> project. I also spoke to the Navy contact Amy Burt today. She
> mentioned that you had already contacted her. I am glad to hear that
> coordination is in the works.
> Thank you for your time and assistance.
> Have a good weekend,
> Amy
>
>
>
> Craig Kohler wrote:
>> Amy,
>> Thank you for providing the National Data Buoy Center (NDBC) this
>> information. We were not aware of the proposed naval training
>> exercise in the GOA. I ask that you include statement that they need
>> to avoid interference with The National Data Buoy Center's DART
>> (Deep-ocean Assessment and Reporting of Tsunamis) and our automated
>> weather reporting buoys and moorings in the exercise area. These
>> networks provide critical weather and tsunami warning data to the
>> American public. For specific locations of the buoys/moorings in
>> this area, please refer to http://www.ndbc.noaa.gov/. We will also
>> provide this information to the Navy contact you provided below.
>> Best regards,
>> Craig
>>
>>
>> Amy B. Cox wrote:
>>> Hello Craig,
>>> I am writing from the NMFS Anchorage field office. We are
>>> reviewing the Navy draft environmental impact statement for the
>>> purposed training activities in the Gulf of Alaska. Matt Eagleton
>>> in our office suggested checking with Chris about your equipment in
>>> the GOA area. We just wanted to make sure that you are aware of the
>>> proposed exercises. I did not notice anything in the draft about
>>> needing to be cautious or avoid any buoys and such. They have
>>> various exercises and such planned which include explosions, live
>>> fire, vessel sinkings, etc.. The website with this information is

>>> http://www.gulfofalaskanavyeis.com/OtherResources.aspx We are
>>> writing comments to the Navy about essential fish habitat. We can
>>> mention something to the effect of:
>>> The NOAA Office of Oceanic and Atmospheric Research, Pacific Marine
>>> Environmental Lab Tsunami Program (Christian Meinig, Division Chief)
>>> maintains a tsunami monitoring network placed throughout the GOA and
>>> North Pacific. NMFS offers that coordination should be made to
>>> ensure this world-wide integrated network is not falsely activated
>>> or real-time tsunami monitoring equipment become damaged. See
>>> http://nctr.pmel.noaa.gov/Dart/index.html You may already be
>>> working with the Navy to ensure that your equipment isn't damaged.
>>> If not though, you may wish to contact them directly also. They are
>>> accepting comments until Jan. 25th for the final EIS.
>>> The contact person is
>>> Amy Burt, Environmental Planner
>>> Naval Facilities Engineering Command Northwest
>>> 1101 Tautog Circle, Suite 203
>>> Silverdale, WA 98315-1101
>>> (360) 396-0924
>>> If you need any more information please just let me know. Also,
>>> if you can let me know if you are already working with the Navy that
>>> would be great. I will not include the above comment in our letter
>>> if it is redundant then.
>>> Thank you,
>>> Amy
>>>
>>>
>>> Christian Meinig wrote:
>>>> Hello Amy:
>>>>
>>>> Thanks for the phone message regarding Navy activities possibly
>>>> affecting the DART array in GOA. The DART array is now operational
>>>> and the contact is:
>>>>
>>>> Craig Kohler
>>>> Craig.Kohler@noaa.gov
>>>>
>>>> in Stennis, MS. He is cc'd above. The locations of the buoys can
>>>> be found here: http://www.ndbc.noaa.gov/
>>>>
>>>> --cheers, Chris
>>>>
>>>
>


46081 - 60.794N 148.285W
46060 - 60.599N 146.838W
46061 - 60.218N 146.825W
46107 - 59.925N 147.992W
46082 - 59.688N 143.399W
46106 - 59.78N 152.09W
46076 - 59.498N 147.983W
Gulf of Alaska
46105 - 59.049N 152.224W
46083 -
Portlock Bank
46077 - 57.92N 154.254W
Kodiak
46080 - 58.035N 149.994W
46410 - 57.634N 143.804W
Kodiak, AK
46001 - 56.3N 148.021W
46085 - 55.855N 142.559W
46078 - 56.074N 152.572W
46409 - 55.301N 148.495W
46409
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© 2009 Google
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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I.1.25 NATIVE VILLAGE OF AFOGNAK

Native Village of Afognak To embrace, protect, develop, and enhance Alutiiq culture, protect our traditional use areas and encourage unity among the Alutiiq of the Kodiak Archipelago

January 22nd, 2010

Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt- Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Department of the Navy:

On behalf of the Native Village of Afognak, a federally recognized tribe of the Kodiak Archipelago, whose mission is to protect our traditional use areas for our tribal members, we are writing in response to the Draft Environmental Impact Statement for Navy Training Activities in the Gulf of Alaska.

We would like to state that we do not support activities that may adversely affect the marine life in the proposed TMAA. Not only do our members rely on the ocean for subsistence, but also many make their living from the ocean.

In closing, we understand the importance of the Navy being prepared, but not at the expense of our marine life and our ocean environment. The Native Village of Afognak strongly supports the No Action Alternative.

Sincerely,

Melissa Borton
Tribal Administrator

315 Mill Bay Road, Suite 201 * Kodiak, AK 99615 * phone 907-486-6357 * fax 907-486-6529

I.1.26 NATIVE VILLAGE OF EYAK

Native Village of Eyak
P.O. Box 1388
Cordova, Alaska 99574
Ph (907) 424-7738 * Fax (907) 424-7739

January 22, 2010

Navy Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Attn: Mrs. Amy Burt – Gulf of Alaska EIS/OEIS Project Manager

Re: Comments on Gulf of Alaska Navy Training Activities EIS/OEIS

Dear Mrs. Burt,

I am writing on behalf of the Native Village of Eyak (NVE) to comment on the Gulf of Alaska Navy Training Activities EIS/OEIS. NVE is a federally recognized tribe with our traditional use area primarily in the Prince William Sound, the Copper River, and the Gulf of Alaska. We are based in Cordova, Alaska, where most of our members currently reside. Since Cordova is an isolated rural community accessible only by air or water, the cost of living is extremely high. For that reason, the majority of our people rely heavily on subsistence hunting, fishing, and gathering for their survival. Consequently, it is imperative that we manage the environment and aquatic resources in the most sustainable and judicious manner. The health and productivity of our environment is in direct correlation with the health and productivity of our community.

The Native Village of Eyak supports the mission of the Navy and the need for readiness training. However, we are very concerned about the North Pacific and Gulf of Alaska ecosystems and encourage the Navy to take every possible precaution to protect this environment. The Gulf of Alaska and Prince William Sound are very important parts of our traditional homeland. NVE deems it vitally important to ensure that the Navy training activities do not adversely impact our aquatic resources. NVE has several concerns in relation to the training activities.

The proposed activities would release a substantial amount of hazardous materials into the marine environment. While the draft EIS contains information on the hazardous content and the pounds of hazardous materials in the individual weapons expended under each alternative, the FEIS should include a table listing the specific content and amounts of the hazardous materials contained in the total expended materials under each alternative. The EIS states that releasing individual expended materials would not have a significant effect on the environment, but does not mention whether the cumulative effect of adding those contaminants into the marine environment was analyzed. Release of toxic substances in the water may be quickly diluted; however, some toxic substances have the potential to bioaccumulate in the food chain. Will the Navy be able to ensure that our subsistence foods will still be safe to eat?

The Gulf of Alaska supports habitats of threatened and endangered populations of marine mammals and salmon. These populations have already been impacted by the Exxon Valdez Oil Spill and have just recently begun to recover. Marine mammals and fish may be physiologically or behaviorally

I.1.27 NATURAL RESOURCE DEFENSE COUNCIL - 1

NRDC
THE EARTH'S BEST DEFENSE

NATURAL RESOURCES DEFENSE COUNCIL

By Facsimile and Federal Express

January 4, 2010

Mrs. Amy Burt
Gulf of Alaska EIS/OIES Project Manager
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101
Tel.: (360) 396-0924
Fax: (360) 396-0857

Re: *Petition for Extension of Public Comment Period on the Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities*

Dear Mrs. Burt:

On behalf of the Natural Resources Defense Council ("NRDC") and our 1.3 million members and activists, I am writing to petition the Navy for an extension of the public comment period on its Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities ("GOA DEIS").

Notice of the comment period was published in the Federal Register on December 11, 2009. See 74 Fed. Reg. 65761. The public has been given only 45 days – over religious and New Years holidays – to submit comments by January 25, 2010 on over 900 pages of dense information. In light of the voluminous information provided by the Navy in justifying its plans and the extensive range of activity proposed, we respectfully request an extension to submit written comments of at least 30 days until February 25, 2010.

Such an extension is necessary to fully protect the public interest by giving citizens the time to thoroughly analyze the Navy's proposal and submit comments on the critical issues raised therein. The Navy's GOA DEIS raises many issues that the public has never been able to address before. Notably, some of the Navy's activities may take place in critical habitat for North Pacific right whales and may affect humpback whale feeding grounds and gray whale migration routes. The public, as well as the scientific

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Santa Monica, CA 90401
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Mrs. Amy Burt
January 4, 2010
Page 2

community, needs sufficient time to identify, analyze, and comment on the scope of the proposed activities and on the Navy's analysis thereof.

The Navy appropriately extended its initial comment periods for the Northwest Training Range Complex DEIS and its Undersea Warfare Training Range DEIS, thus providing an additional 30 days for the public to comment due to the sheer size of, and the many issues raised in, those DEISs. We believe at the very least that a similar extension is warranted here. Therefore, we strongly urge you to grant this petition and extend the comment period. As always, we would welcome discussion with the Navy at any time.

Very truly yours,



Taryn G. Kiekow
Staff Attorney, Marine Mammal Protection Project
Natural Resources Defense Council

Cc: Michael Payne, Chief
Permits, Conservation and Education Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910-3225

Senator Mark Begich
Peterson Tower
510 L St, Suite 750
Anchorage, AK 99501-1954

Senator Lisa Murkowski
Peterson Tower
510 L Street, Suite 550
Anchorage, AK 99501-1954

Representative Don Young
Peterson Tower
510 L St, Suite 580
Anchorage, AK 99501-1954

I.1.28 NATURAL RESOURCE DEFENSE COUNCIL - 2

NRDC
THE EARTH'S BEST DEFENSE

NATURAL RESOURCES DEFENSE COUNCIL

By Overnight Delivery

January 25, 2010

Mrs. Amy Burt
Gulf of Alaska EIS/OIES Project Manager
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101
Tel.: (360) 396-0924
Fax: (360) 396-0857

Re: *Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities*

Dear Mrs. Burt:

On behalf of the Natural Resources Defense Council ("NRDC"), Alaska Community Action on Toxics, Alaska Marine Conservation Council, Center for Biological Diversity, Cook Inletkeeper, International Fund for Animal Welfare, Juneau Group Sierra Club, Kodiak Audubon, North Gulf Oceanic Society, Oceana, Ocean Futures Society, Prince William Soundkeeper, Sierra Club Alaska Chapter, The Kodiak Gray Whale Project, Turning the Tides, and Jean-Michel Cousteau, and our millions of members and activists, thousands of whom reside in Alaska, we appreciate the opportunity to submit comments regarding the Navy's Draft Environmental Impact Statement/ Overseas Environmental Impact Statement ("DEIS") for its Training Activities in the Gulf of Alaska ("GOA"). *See* 74 Fed. Reg. 65761 (Dec. 11, 2009). Please include these comments and attachments in the administrative record.[1]

While our organizations recognize the Navy's important role in ensuring national security, we also value the security a clean and healthy environment provides. National security and environmental integrity are not mutually exclusive, and we encourage the Navy to train in a way that protects the valuable natural resources in the GOA. We are profoundly concerned, however, that Navy's DEIS falls short of ensuring such protection. As you are aware, the Navy's preferred alternative (Alternative 2) would

[1] We aware that comments may be submitted separately by government agencies, individual scientists, environmental organizations, and the public. All of these comments are hereby incorporated by reference.

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dramatically increase the amount of training in the Temporary Maritime Activity Area ("TMAA") in the GOA between April and October every year. The TMAA extends across 42,146 square nautical miles across the GOA south of Prince William Sound and east of Kodiak Island. The Navy plans to introduce – for the first time – extensive sonar training in the GOA.[2] Its preferred alternative would use many different sources of active sonar, totaling over 1,160 hours of sonar use every year. DEIS at 3.8-146. These training exercises would also employ a battery of other acoustic sources and explosives detonations in ocean surface and undersea areas, special use airspace, and training land areas. In addition, the Navy plans to use a Portable Undersea Tracking Range, add a second carrier strike group exercise and conduct sinking exercises in the TMAA. DEIS at ES-1.

The Navy also plans to abandon at least 352,000 pounds of spent material (both hazardous and non hazardous) in the TMAA every year, including 360 bombs, 66 missiles, 644 targets and pyrotechnics, 26,376 gunshells, 11,400 small caliber rounds, and 1,587 sonobuoys. Over 10,300 pounds of this expended material is hazardous. DEIS at ES-15 to 28; 3.2-28 to 34; 3.6-34.

These proposed training activities would pose significant risk to whales, fish, and other wildlife that depend on sound for breeding, feeding, navigating, and avoiding predators—in short, for their survival. Under Alternatives 1 and 2, the Navy would employ mid-frequency active sonar, which has been implicated in mass injuries and mortalities of whales around the globe.[3] The same technology is known to affect marine mammals in countless other ways, inducing panic responses, displacing animals,

---

[2] The DEIS states that no active mid-frequency sonar is used in the GOA (or at least from exercises involving carrier-strike groups). DEIS at ES-11 (describing the no Action Alternative). While it may be true that scripted exercises during Northern Edge or other major events do not currently involve mid-frequency sonar, that does not mean that individual units do not use sonar opportunistically while in the area, or that sonar is not used for sustainment training, unit-level exercises, equipment testing or calibration, or other purposes. We request that the Navy review activity over a reasonable time period to establish an actual baseline for analysis.

In previous requests to the Navy NRDC asked the Pacific Fleet review its logs for active sonar use occurring in the GOA between June 1, 2004 and July 20, 2004 – which corresponded to an unusual mortality of beaked whales in the area – and indicate in its DEIS whether mid-frequency sonar was used. The Navy did review the 2004 event in Appendix F of the DEIS and concluded that "[t]here was no ASW component to the exercise…There were no events in the Alaska Shield/Northern Edge exercise that could have caused or been related to any of the strandings…" DEIS at F-27. As noted above, just because the exercises during Northern Edge did not involve mid-frequency sonar does not mean that individual units were not using sonar opportunistically or for other purposes. We request that the Navy disclose whether ANY sonar is or has been used in the GOA over a reasonable time period (at least as far back as 2004), including for sustainment training, unit-level exercises, equipment testing or calibration, or any other purpose.

[3] Military sonar generates intense sound that can induce a range of adverse effects in whales and other species – from significant behavioral changes to injury and death. The most widely reported and dramatic of these events are the mass strandings of beaked whales and other marine mammals that have been associated with military sonar use. A brief summary of the stranding record appears in Appendix B.

and disrupting crucial behavior such as foraging. By the Navy's own estimates, sonar training exercises from its preferred alternative will result in more than 425,000 marine mammal "takes" (behavioral impacts, harassment, injury) every year – over 2.125 million takes during the course of the permit it must obtain under the Marine Mammal Protection Act. DEIS at 3.8-148. In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the TMAA. DEIS at 3.8-1 to 4. The GOA training activities would also affect fisheries and essential fish habitat and release a large amount of hazardous and expended materials into the waters. *See* Appendices A and B for a detailed discussion of impacts.

The National Environmental Policy Act ("NEPA") requires the Navy to employ rigorous standards of environmental review, including a full explanation of potential impacts, a comprehensive analysis of all reasonable alternatives, a fair and objective accounting of cumulative impacts, and a thorough description of measures to mitigate harm.

Unfortunately, the DEIS released by the Navy falls far short of these mandates and fails to satisfy the Navy's legal obligations under NEPA. Before issuing a final EIS, the Navy must revise the environmental impacts, alternatives, cumulative impacts and mitigation analysis in the DEIS (described in detail in Appendix A). It must also fully address the considerable scientific record that has developed around sonar and whale injury and mortality, and adjust its acoustic impacts analysis and assessment model accordingly (discussed in Appendices B and C). A few additional concerns are highlighted below.

One of our primary concerns is the paucity of survey data necessary to estimate marine mammal density or distribution. Without these estimates, it is impossible to adequately evaluate the impacts on marine mammals or to estimate harm, as required by NEPA. Nor can the Navy support its environmental analysis and take estimates. A closely related concern is the Navy's failure to protect any area within the TMAA from sonar training activities. There is a general consensus among the scientific community that "[p]rotecting marine mammal habitat is…the most effective mitigation measure currently available" to reduce the harmful impacts of mid-frequency sonar on marine mammals.[4] Nonetheless, the DEIS does not even consider establishing any protection areas in the TMAA where sonar training would be limited or excluded.

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[4] See Letter from Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere to Nancy Sutley, Chair, Council on Environmental Quality dated Jan. 19, 2010, *available at* http://www.nrdc.org/media/docs/100119.pdf; see also Agardy, T., Aguilar Soto, N., Cañadas, A., Engel, M., Frantzis, A., Hatch, L., Hoyt, E., Kaschner, K., LaBrecque, E., Martin, V., Notarbartolo di Sciara, G., Pavan, G., Servidio, A., Smith, B., Wang, J., Weilgart, L., Wintle, B., and Wright, A. A global scientific workshop on spatio-temporal management of noise. Report of workshop held in Puerto Calero, Lanzarote, (June 4-6, 2007); ECS Working Group: Dolman, S., Aguilar Soto, N., Notabartolo di Sciara, G., Andre, M., Evans, P., Frisch, H., Gannier, A., Gordon, J., Jasny, M., Johnson, M., Papanicolopulu, I., Panigada, S., Tyack, P., and Wright, A. Technical report on effective mitigation for active sonar and beaked whales. Working group convened by European Cetacean Society, (2009); OSPAR Commission, Assessment of the environmental impact of underwater noise. OSPAR Biodiversity Series, (2009);

Until sufficient information on the density and distribution of marine mammals is obtained – and any salient protection areas established – the Navy should not increase sonar training in the GOA. We recommend that the Navy: (1) obtain additional data on marine mammal density and distribution in the TMAA, (2) re-analyze its impacts analysis, take estimates, and alternatives and mitigation analysis accordingly, and (3) reissue its DEIS. Should the Navy proceed before obtaining sufficient density and distribution information, we believe the law requires the adoption of the No Action Alternative until sufficient information is obtained.

The Navy Has Not Taken a "Hard Look" Under NEPA

NEPA requires that the potential environmental impacts of any "major Federal actions significantly affecting the quality of the human environment" be considered through the preparation of an environmental impact statement ("EIS"). *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 348 (1989); 42 U.S.C. § 4332. The fundamental purpose of an EIS is to compel decision-makers to take a "hard look" at a particular action – both at the environmental impacts it will have and at the alternatives and mitigation measures available to reduce those impacts – *before* a decision to proceed is made. 40 C.F.R. §§ 1500.1(b), 1502.1; *Baltimore Gas & Electric v. NRDC*, 462 U.S. 87, 97 (1983); *Robertson*, 490 U.S. at 349. While NEPA "does not commend the agency to favor an environmentally preferable course of action," an agency may only make a decision to proceed after taking a "hard look" at environmental consequences. *Sabine River Auth. v. Dep't of Interior*, 951 F.2d 669, 676 (5th Cir. 1992)(internal citations omitted). This "hard look" requires agencies to obtain high quality information and accurate scientific analysis. 40 C.F.R. § 1500.1(b).

It is impossible to characterize the DEIS as taking a "hard look" because of the Navy's failure to obtain information regarding marine mammal densities and distribution. The flaws stemming from this failure reverberate throughout the DEIS, most notably in the Navy's impacts analysis, take estimates and mitigation proposals.

The Navy Lacks Sufficient Information

NEPA requires agencies to ensure the "professional integrity, including scientific integrity" of material relied upon in an EIS. 40 C.F.R. § 1502.24. To that end, agencies must make every attempt to obtain and disclose data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. 40 C.F.R. § 1502.22(a).

The Navy simply has not obtained the required information. The Navy is unable to establish densities for many marine mammal populations in the TMAA, including blue

Parsons, E.C.M., Dolman, S.J., Wright, A.J., Rose, N.A., and Burns, W.C.G. Navy sonar and cetaceans: just how much does the gun need to smoke before we act? Marine Pollution Bulletin 56: 1248-1257 (2008).

whales, North Pacific right whales and sei whales – all of which are endangered. DEIS at 3.8-2. Nor is it able to estimate the density of harbor porpoises, which are particularly vulnerable to acoustic impacts. DEIS at 3.8-3. The Navy argues that blue whales, North Pacific right whales and sei whales are "too few in number to allow for quantitative analysis," but it cannot escape its responsibilities under NEPA simply by claiming that whales are "very rare." DEIS 3.8-2, 5, 9. The "rareness" and low abundance of those whales, if anything, should warrant additional monitoring (including acoustic and visual), safeguards and protections – particularly of North Pacific right whales, one of the most endangered species of whales on the planet. And although the DEIS claims that blue whales are "rare" in the GOA, a 2009 study presents new evidence indicating that as the northeastern Pacific population recovers from whaling, blue whales increasingly may be returning to former GOA feeding grounds. These whales appear to be part of the same stock that is seen off of California.[5]

The Navy further acknowledges that the existing information for other species and habitat in the GOA is extremely "limited" and "localized." DEIS at 3.8-9. For instance, with the exception of Rone et al. (2009), none of the surveys focused on the TMAA itself – most surveyed nearshore areas outside the TMAA. DEIS at 3.8-9. In addition, some of the surveys were designed to count species other than those targeted in the density estimate.[6] Recognizing the dearth of data, the Navy did fund a targeted 10-day marine mammal line-transect survey conducted by Rone et al. in April 2009 that yielded the most direct data available on fin whales and humpback whales in the TMAA.[7] But that survey – hampered by several "challenges" including "limited survey time, a large survey area, inclement weather, and the lack of arrival of sonobuoys"[8] – is inadequate to establish abundance and density estimates for most marine mammals in the TMAA or to identify important marine mammal habitat. Despite these challenges, however, the survey encountered an "unexpectedly large number" of sightings of marine mammals.[9] This suggests that the TMAA represents rich habitat for cetaceans, particularly in continental shelf and slope waters, that requires further study.

Having sufficient data is essential for the Navy to meet its responsibilities under NEPA. The Navy cannot issue a final EIS (nor can the National Marine Fisheries issue a Biological Opinion under the Endangered Species Act or an incidental take permit

---

[5] See Calambokidis J, Barlow J, Ford JKB, Chandler TE, Douglas AB. 2009. Insights into the population structure of blue whales in the eastern North Pacific from recent sightings and photographic identification. Marine Mammal Science 25:816-832.

[6] For example, the Moore et al survey of gray whales was designed to measure pinnipeds. See Moore, S.E., K.M. Wynne, J. Clement-Kinney, and J.M. Grebmeier, 2007. Gray whale occurrence and forage southeast of Kodiak Island, Alaska. Marine Mammal Science 23(2):419–428.

[7] See Rone, B., A. Douglas, P. Clapham, A. Martinez, L. Morse and J. Calambokidis. 2009. Cruise Report for the April 2009 Gulf of Alaska Line-Transect Survey (GOALS) in the Navy Training Exercise Area. Report issued by National Marine Mammal Laboratory and Cascadia Research. Naval Postgraduate School Tech Report # NPS-OC-09-007.

[8] Id. at 15.

[9] Id.

under the Marine Mammal Protection Act) without adequate information on densities and distributions of marine mammals in the TMAA. Until the Navy collects the necessary information, it may be significantly underestimating marine mammal densities and thereby affecting its impact analysis and take estimates. To meet its responsibilities under NEPA, Navy should sponsor a multi-year, multi-seasonal survey effort within the TMAA that can serve as a basis for both improved environmental assessment and mitigation. Based on the results of those surveys, the Navy may need to revise its alternative analysis and site at least some of its proposed exercises in lower value marine mammal habitat elsewhere in the GOA, or adopt the No-Action Alternative. Until then, the Navy's NEPA analysis remains arbitrary and capricious.

The Navy Fails to Consider Effective Mitigation

There is general consensus that protection areas – in which the use of mid-frequency sonar would not occur – represent the most effective means currently available to reduce the impacts of mid-frequency sonar on marine mammals.[10] The National Oceanic Atmospheric Administration ("NOAA") recently completed a review of the Navy's sonar mitigation. It concluded that "ongoing mitigation efforts, in our view, must do more" to address uncertainties and protect marine mammals.[11] NOAA emphasized the importance of habitat identification and avoidance, stating that "[p]rotecting important marine mammal habitat is generally recognized to be the most effective mitigation measure currently available."[12] Yet the Navy makes no provision whatsoever for protection areas in the TMAA.

Appendix A contains a detailed description of mitigation measures that the Navy can – and should – adopt. At a minimum, however, the Navy must assess the value of marine mammal habitat[13] both in the TMAA itself and the broader GOA, and protect any higher-value areas identified. We recognize that predictive habitat modeling to determine potential marine mammal hotspots is hindered by the lack of survey data in the TMAA, which is why additional surveys absolutely must be undertaken before the Navy issues a final EIS. The survey data can then be used to generate a predictive habitat model upon which appropriate mitigation can be based.

Already there exists important marine mammal habitat that can be readily identified. The TMAA is only 16 nautical miles west of critical habitat for the highly endangered North Pacific right whale (DEIS at 3.8- 22, 23) and directly adjacent to critical habitat

[10] Supra, note 4.

[11] See Letter from Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere to Nancy Sutley, Chair, Council on Environmental Quality dated Jan. 19, 2010, *available at* http://www.nrdc.org/media/docs/100119.pdf

[12] Id.

[13] NOAA has committed to conduct a series of workshops to learn more about marine mammal "hotspots," particularly through available predictive models. Based on the results of these workshops, NOAA will consider additional measures to reduce harm from sonar, in future rulemakings and authorizations under the Marine Mammal Protection Act.

for Steller sea lions (DEIS 3.8-34). The North Pacific right whale is among the most endangered species of cetaceans in the world.[14] Mid-frequency sound below 140 dB has been shown to disrupt foraging in right whales and cause them to ascend rapidly to just below the surface where they face a significantly greater risk of ship strike.[15] At a minimum, the Navy should establish a sufficient buffer between these critical habitats and the TMAA. In addition, the Navy should protect feeding grounds for humpback whales and gray whale migratory routes.[16] The Navy should also protect areas of high bathymetric relief, where there are likely to be high concentrations of beaked whales and other deep diving species.

Conclusion

For the reasons set forth above and in greater detail in the Appendices below and attached critique by Dr. David Bain, we urge the Navy to satisfy its obligations under NEPA and other applicable laws. To that end, the Navy should conduct multi-year, multi-seasonal surveys to obtain adequate information on densities and distributions of marine mammals in the TMAA. These surveys would serve as a basis for predictive habitat modeling and protective mitigation. Once the Navy obtains additional data on marine mammal density and distribution, it should re-analyze its impacts analysis, take estimates and mitigation measures accordingly and reissue its DEIS. Until this additional information is obtained, the Navy should only consider the No Action Alternative.

Thank you for your consideration of our comments, and we welcome the opportunity to discuss this matter with you at any time.

Sincerely,

Taryn Kiekow
Staff Attorney

[14] See, e.g., Committee on the Status of Endangered Wildlife in Canada (COSEWIC), COSEWIC Assessment and Update Status Report on the North Pacific Right Whale Eubalaena japonica in Canada (2004).

[15] See D.P. Nowacek, M.P. Johnson, and P.L. Tyack, North Atlantic Right Whales (Eubalaena glacialis) Ignore Ships but Respond to Alerting Stimuli, 271 Proceedings of the Royal Society of London, Part B: Biological Sciences 227 (2004).

[16] Gray whales migrate through this area twice a year. While they usually maintain a distance of less than 2km to the shore, they are known to move further offshore south of Kodiak Island. Peak abundance is generally in April through May for the northbound migration, and November through December for the southbound migration. In addition, some groups of gray whales form resident feeding aggregations that maintain a presence in the GOA throughout the summer feeding season off of Kodiak Island, peaking in September through November. See Moore SE, Wynne KM, Kinney JC, Grebmeier JM, Gray whale occurrence and forage southeast of Kodiak Island, Alaska. Marine Mammal Science 23:419-428 (2007).

APPENDIX A

THE NAVY'S DEIS IS FATALLY FLAWED AND FAILS TO COMPLY WITH THE BASIC REQUIREMENTS OF NEPA

As set forth below, the Navy's DEIS does not meet the rigorous standards set forth in the National Environmental Policy Act. We urge the Navy to reissue its EIS and substantially alter the approach it has taken thus far. The Navy's scope of review must be expanded, its alternatives analysis broadened, its mitigation plan significantly improved, and its impact assessment revised to reflect the scientific evidence of mid-frequency sonar's effects on marine life. These critical steps must be undertaken if the Navy's EIS is to comply with federal law.

I. Legal Framework: The National Environmental Policy Act

The National Environmental Policy Act of 1969 ("NEPA") "declares a broad national commitment to protecting and promoting environmental quality." *Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 348 (1989). NEPA establishes a national policy to "encourage productive and enjoyable harmony between man and his environment" and "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." 42 U.S.C. § 4321. In order to achieve its broad goals, NEPA mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [it]." 42 U.S.C. § 4332.

Central to NEPA is its requirement that, before any federal action that "*may* significantly degrade some human environmental factor" can be undertaken, agencies must prepare an EIS. *Steamboaters v. F.E.R.C.*, 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original). The requirement to prepare an EIS "serves NEPA's action-forcing purpose in two important respects." *Robertson*, 490 U.S. at 349. First, "the agency, in reaching its decision, will have available, and will *carefully consider, detailed information* concerning significant environmental impacts[,]" and second, "the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision." *Id.* (emphasis added). As the Supreme Court explained: "NEPA's instruction that all federal agencies comply with the impact statement requirement…'to the fullest extent possible' [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle." *Flint Ridge Development Co. v. Scenic Rivers Ass'n*, 426 U.S. 776, 787 (1976).

The fundamental purpose of an EIS is to force the decision-maker to take a "hard look" at a particular action – at the agency's need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it – before the decision to proceed is made. 40 C.F.R. §§ 1500.1(b), 1502.1; *Baltimore Gas & Electric v. NRDC*, 462 U.S. 87, 97 (1983). This "hard look" requires agencies to

obtain high quality information and accurate scientific analysis. 40 C.F.R. § 1500.1(b). "General statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." *Klamath-Siskiyou Wilderness Center v. Bureau of Land Management*, 387 F.3d 989, 994 (9th Cir. 2004) (*quoting Neighbors of Cuddy Mountain v. United States Forest Service*, 137 F.3d 1372, 1380 (9th Cir. 1998)). The law is clear that the EIS must be a pre-decisional, objective, rigorous, and neutral document, not a work of advocacy to justify an outcome that has been foreordained.

In nearly every respect, the Navy's DEIS fails to meet the high standards of rigor and objectivity required under NEPA. The Navy has failed to conduct the "hard look" necessary to thoroughly examine the many environmental consequences of its proposed action.

II. The Navy Fails to Properly Analyze Impacts on Marine Mammals

The Navy's DEIS does not properly analyze the environmental impacts. Its analysis also substantially understates the potential effects of sonar on marine wildlife. For instance, the Navy fails to acknowledge risks posed to a wide range of marine species – including the highly endangered North Pacific right whale – from its training activities. The DEIS concludes that only one Dall's porpoise would suffer serious injury or die during the many hours of proposed sonar training. DEIS at 3.8-148. The Navy reaches this conclusion by excluding relevant information adverse to its interests, using approaches and methods that are unacceptable to the scientific community and ignoring entire categories of impacts. As discussed in detail in Appendix C and the attached critique by Dr. David Bain, the Navy's assessment of acoustic impacts is also highly problematic.

A. Acoustic Impacts on Marine Mammals

NEPA requires agencies to ensure the "professional integrity, including scientific integrity," of the discussions and analyses that appear in EISs. 40 C.F.R. § 1502.24. To that end, they must make every attempt to obtain and disclose data necessary to their analysis. *See* 40 C.F.R. § 1502.22(a). Agencies are further required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community." 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Such requirements become acutely important in cases where, as here, so much about a program's impacts depend on newly emerging science.

In this case, the Navy's assessment of impacts is consistently undermined by its failure to meet these fundamental responsibilities of scientific integrity, methodology, investigation, and disclosure. As set forth in greater detail in Appendix C and the attached critique by Dr. Bain, the DEIS disregards a great deal of relevant information adverse to the Navy's interests, uses approaches and methods that would not be

acceptable to the scientific community, and ignores whole categories of impacts. In short, it leaves the public with an analysis of harm—behavioral, auditory, and physiological—that is at odds with established scientific authority and practice. The Navy must revise its acoustic impacts analysis, including its thresholds and risk function, to comply with NEPA.

B. Other Impacts on Marine Mammals

The activities proposed for the GOA may have impacts that are not limited to the effects of ocean noise. Unfortunately, the Navy's analysis of these other impacts is cursory and inadequate.

First, the Navy fails to adequately assess the impact of stress on marine mammals, a serious problem for animals exposed even to moderate levels of sound for extended periods.[17] DEIS at 3.8-72 to 73. As the Navy has previously observed, stress from ocean noise—alone or in combination with other stressors, such as biotoxins—may weaken a cetacean's immune system, making it "more vulnerable to parasites and diseases that normally would not be fatal."[18] Moreover, according to studies on terrestrial mammals, chronic noise can interfere with brain development, increase the risk of myocardial infarctions, depress reproductive rates, and cause malformations and other defects in young—all at moderate levels of exposure.[19] Because physiological stress responses are highly conservative across species, it is reasonable to assume that marine mammals would be subject to the same effects. Yet despite the potential for stress in marine mammals and the significant consequences that can flow from it, the Navy unjustifiably assumes that such effects would be minimal.

Second, the Navy fails to consider the risk of ship strikes with large cetaceans, as exacerbated by the use of active acoustics. DEIS at 3.8.3 and 3.8.4 generally. For example, right whales have been shown to engage in dramatic surfacing behavior, increasing their vulnerability to ship strikes, on exposure to mid-frequency alarms

[17] See National Research Council, Ocean Noise and Marine Mammals.

[18] Navy, Hawaii Range Complex Draft Environmental Impact Statement/ Overseas Environmental Impact Statement at 5-19 to 5-20 (2007). Additional evidence relevant to the problem of stress in marine mammals is summarized in A.J. Wright, N. Aguilar Soto, A.L. Baldwin, M. Bateson, C.M. Beale, C.Clark, T. Deak, E.F. Edwards, A. Fernández, A. Godinho, L. Hatch, A. Kakuschke, D. Lusseau, D. Martineau, L.M. Romero, L. Weilgart, B. Wintle, G. Notarbartolo di Sciara, and V. Martin, Do marine mammals experience stress related to anthropogenic noise?, 20 International Journal of Comparative Psychology, 274-316 (2007); see also T.A. Romano, M.J. Keogh, C. Kelly, P. Feng, L. Berk, C.E. Schlundt, D.A. Carder, and J.J. Finneran, Anthropogenic Sound and Marine Mammal Health: Measures of the Nervous and Immune Systems Before and After Intense Sound Exposure, 61 Canadian Journal of Fisheries and Aquatic Sciences 1124, 1130-31 (2004).

[19] See, e.g., E.F. Chang and M.M. Merzenich, Environmental Noise Retards Auditory Cortical Development, 300 Science 498 (2003) (rats); S.N. Willich, K. Wegscheider, M. Stallmann, and T. Keil, Noise Burden and the Risk of Myocardial Infarction, European Heart Journal (2005) (Nov. 24, 2005) (humans); F.H. Harrington and A.M. Veitch, Calving Success of Woodland Caribou Exposed to Low-Level Jet Fighter Overflights, 45 Arctic vol. 213 (1992) (caribou).

above 133 dB re 1 μPa (SPL)—a level of sound that can occur many tens of miles away from the sonar systems slated for the GOA.[20] DEIS 3.8-96. A conservative approach would assume that other large whales (which, as the DEIS repeatedly notes, are already highly susceptible to vessel collisions) are subject to the same hazard. For instance, fin whales also occur within the GOA and appear to be particularly vulnerable to ship strikes.[21] Indeed, in a recent 16-year survey of ship strikes in Washington State waters, fin whales "had the highest incidence of ante-mortem ship strike" of the seven species of large whales examined.[22] Even the DEIS finds that "[w]orldwide historical records indicate fin whales were the most likely species to be struck by vessels." DEIS at 3.8-16. But the DEIS then dismisses the effects of vessel strikes on fin whales based solely on an "unpublished preliminary summary of opportunistically collected reports." DEIS at 3.8-16. The DEIS fails to discuss even the potential for mortality or injury to fin whales from ship strikes. NEPA's hard look requires the Navy to undertake a far more detailed examination of this potentially significant source of mortality for fin whales under even the No Action Alternative, as well as from the increase in vessel traffic that would occur under Alternatives 1 and 2.

Third, in the course of its training activities, the Navy would release a host of toxic chemicals, hazardous materials and waste into the marine environment that could pose a threat to marine mammals over the life of the range. Under its preferred alternative, the Navy also plans to abandon at least 352,000 pounds of spent material (both hazardous and non hazardous) in GOA waters every year, including 360 bombs, 66 missiles, 644 targets and pyrotechnics, 26,376 gunshells, 11,400 small caliber rounds, and 1,587 sonobuoys. Over 10,300 pounds of this expended material is hazardous. DEIS at ES-15 to 28; 3.2-28 to 34; 3.6-34. Nonetheless, the DEIS fails to adequately consider the cumulative impacts of these toxins on marine mammals from past, current, and proposed training exercises. Careful study is needed into the way toxins might disperse and circulate within the area and how they may affect marine wildlife. The Navy's assumption that expended materials and toxics would dissipate or become buried in sediment leads to a blithe conclusion that releases of hazardous material would have no adverse effects. Given the amount of both hazardous and nonhazardous materials, this discussion is inadequate under NEPA.

Fourth, the Navy does not adequately analyze the potential for and impact of oil spills. As evidenced by the 1989 *ExxonValdez* oil spill, there is a significant existing risk of an oil spill in the GOA. This risk is exacerbated by increasing the tempo and intensity of Navy training, which will involve more vessels, more transits, and longer missions

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[20] Nowacek et al., North Atlantic Right Whales, 271 Proceedings of the Royal Society of London, Part B: Biological Sciences at 227. The North Pacific right whale is an endangered species closely related to the studied North Atlantic right whale.

[21] See http://www.cascadiaresearch.org/WestportBm20090113.htm

[22] Annie B. Douglas, Incidence of ship strikes of large whales in Washington State, Journal of the Marine Biological Association of the United Kingdom, 2008, 88(6), 1121–1132, *available at* http://www.cascadiaresearch.org/reports/Douglas%20et%20al%202008-Incidence%20of%20ship%20strikes%20of%20large%20whales.pdf.

throughout the TMAA.[23] In light of this history and the extraordinarily valuable and sensitive natural resources that occur in the GOA, the Navy must evaluate its spill response plan and station salvage equipment accordingly.

Finally, the Navy's analysis cannot be limited only to direct effects, *i.e.*, effects that occur at the same time and place as the training exercises that would be authorized. 40 C.F.R. § 1508.8(a). It must also take into account the activity's indirect effects, which, though reasonably foreseeable (as the DEIS acknowledges), may occur later in time or are further removed. 40 C.F.R. § 1508.8(b). This requirement is particularly critical in the present case given the potential for sonar exercises to cause significant long-term impacts not clearly observable in the short or immediate term (a serious problem, as the National Research Council has observed).[24] Thus, for example, the Navy must not only evaluate the potential for mother-calf separation but also the potential for indirect effects—on survivability—that might arise from that transient change. 40 C.F.R. § 1502.16(b).

Without further consideration of these impacts, and mitigation and alternatives developed to address those impacts, the DEIS does not pass NEPA muster.

C. Other Impacts on Wildlife

The same concerns that apply to marine mammals – such as injury or death from mid-frequency active sonar, collisions with ships, bioaccumulation of toxins, and stress – apply to sea turtles, birds and other biota as well. The Navy must adequately evaluate impacts and propose mitigation for each category of harm. 40 C.F.R. §§ 1502.14, 1502.16.

The effects of mid-frequency active sonar on sea turtles are glossed over on the grounds that their best hearing range appears to occur below 1 kHz. DEIS at 3.7-5 to 6. But having their best acoustic sensitivity in this range does not mean that sea turtles are oblivious to noise at higher frequencies. As the Navy admits, juvenile and adult loggerheads hear sounds all the way up to 1 kHz, suggesting that they continue to detect sounds at higher levels, including potentially the lower end of the intense mid-frequency sources intended for the range. Furthermore, they have been shown to engage in startle and escape behavior – behavior that may involve diving and surfacing – and to experience heightened stress in response to vessel noise. Thus, a more rigorous analysis of potential impacts of mid-frequency sonar is necessary.

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[23] We note that the Navy should include in its analysis and disclose to the public a chart that shows how its operating areas overlap shipping lanes, recommended routes, and Areas to Be Avoided as an indication of the potential for conflict with other vessels.

[24] "Even transient behavioral changes have the potential to separate mother-offspring pairs and lead to death of the young, although it has been difficult to confirm the death of the young." National Research Council, Ocean Noise and Marine Mammals at 96.

Nor is the Navy's reasoning with regard to seabirds any more sound. Although the Navy acknowledges that "little is known about the general hearing or underwater hearing capabilities of birds" (DEIS at 3.9-7), it then inexplicably concludes that because ther is "no evidence that birds utilize sound underwater to forage or locate prey…[any] effects were unlikely". DEIS at 3.9-8. Such reasoning does not bear up to any serious scrutiny. Seabirds occur in the GOA, dive underwater (in some cases to depths of hundreds of feet), and are sensitive to same frequencies used by the Navy's acoustic sources. They must receive further analysis in the DEIS, both for the direct impacts they may suffer on exposure to the Navy's acoustic sources and for the impacts they may incur indirectly through depletion of prey species and hard bottom habitat. 40 C.F.R. § 1502.16(a), (b).

Without further consideration of these species, the Navy's review is incomplete.

III. The Navy Failed to Analyze the Impacts on Fish and Fisheries

The GOA is a highly productive region for fish populations. It supports some of the most productive and commercially important fisheries in the United States (including salmon, halibut, crab, shrimp, pollock, Pacific cod, and mackerel fisheries). The TMAA supports six species of salmonoids – five of which are designated as "endangered" or "threatened" (Chinook, coho, chum, pink, and sockeye salmon and steelhead trout). The TMAA also supports hundreds of other species, including Pacific halibut, groundfish (walleye pollock, Pacific, sablefish, rockfishes, rex sole, Dover sole, arrowtooth flounder, etc.), dungeness crab, and scallops. In addition, 68 fish and invertebrate species with federally designated essential fish habitat occur in the TMAA.

In its DEIS, the Navy fails to acknowledge the impacts of anthropogenic sound on fish, fisheries and essential fish habitat. On the one hand, the Navy claims that there is a "dearth of empirical information on the effects of exposure to sound, [especially] sonar…." DEIS at 3.6-43. Yet on the other hand it ignores a wide-range of scientific studies on the impacts of noise on fish, claiming the studies "would be very difficult to extrapolate" and "focused on behavior of individuals of a few species and it is unlikely their responses are representative of the wide diversity of other marine fish species." DEIS at 3.6-27, 43. The Navy is therefore able to conclude — without basis —that noise from its training activities – including both mid-frequency active sonar and underwater detonations – would have no significant impact on fish, fisheries and essential fish habitat.

The Navy's conclusion not only contradicts the available scientific literature on noise but also ignores the valid concerns of fishermen. For example, fisherman concerned with declining catch rates wrote letters opposing the Navy's proposal to build an Undersea Warfare Training Range off the coast of North Carolina in 2005. Those fishermen reported sharp declines in catch rates in the vicinity of Navy exercises.

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A. Decline in Catch Rates

For years, fisheries in various parts of the world have complained about declines in their catch after intense acoustic activities (including naval exercises) moved into the area, suggesting that noise is seriously altering the behavior of some commercial species.[25] A group of Norwegian scientists attempted to document these declines in a Barents Sea fishery and found that catch rates of haddock and cod (the latter known for its particular sensitivity to low-frequency sound) plummeted in the vicinity of an airgun survey across a 1600-square-mile area. In another experiment, catch rates of rockfish were similarly shown to decline.[26] Drops in catch rates in these experiments range from 40 to 80 percent.[27] A variety of other species, herring, zebrafish, pink snapper, and juvenile Atlantic salmon, have been observed to react to various noise sources with acute alarm.[28]

In their comments on the Navy's Draft Environmental Impact Statement for the proposed Undersea Warfare Training Range off the coast of North Carolina, several fishermen and groups of fishermen independently reported witnessing sharp declines in catch rates of various species when in the vicinity of Navy exercises.[29] These reports are also indicative of behavioral changes –such as a spatial redistribution of fish within the water column – that could similarly affect the fisheries in the GOA.

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[25] See "'Noisy' Royal Navy Sonar Blamed for Falling Catches," Western Morning News, Apr. 22, 2002 (sonar off the U.K.); Percy J. Hayne, President of Gulf Nova Scotia Fleet Planning Board, "Coexistence of the Fishery & Petroleum Industries," www.elements.nb.ca/theme/fuels/percy/hayne.htm (accessed May 15, 2005) (airguns off Cape Breton); R.D. McCauley, J. Fewtrell, A.J. Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A. Adhitya, J. Murdoch, and K. McCabe, Marine Seismic Surveys: Analysis and Propagation of Air-Gun Signals, and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles, Fishes, and Squid 185 (2000) (airguns in general).

[26] A. Engås, S. Løkkeborg, E. Ona, and A.V. Soldal, Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod (Gadus morhua) and Haddock (Melanogrammus aeglefinus), 53 Canadian Journal of Fisheries and Aquatic Sciences 2238-49 (1996); J.R. Skalski, W.H. Pearson, and C.I. Malme, Effects of Sound from a Geophysical Survey Device on Catch-Per-Unit-Effort in a Hook-and-Line Fishery for Rockfish (Sebastes spp.), 49 Canadian Journal of Fisheries and Aquatic Sciences 1357-65 (1992). See also S. Løkkeborg and A.V. Soldal, The Influence of Seismic Exploration with Airguns on Cod (Gadus morhua) Behaviour and Catch Rates, 196 ICES Marine Science Symposium 62-67 (1993).

[27] Id.

[28] See J.H.S. Blaxter and R.S. Batty, The Development of Startle Responses in Herring Larvae, 65 Journal of the Marine Biological Association of the U.K. 737-50 (1985); F.R. Knudsen, P.S. Enger, and O. Sand, Awareness Reactions and Avoidance Responses to Sound in Juvenile Atlantic Salmon, Salmo salar L., 40 Journal of Fish Biology 523-34 (1992); McCauley et al., Marine Seismic Surveys at 126-61.

[29] See comments compiled by the Navy and posted on the Undersea Warfare Training Range EIS site, *available at* http://www.projects.earthtech.com/USWTR (e.g., comments of S. Draughon, S. Fromer, L. and F. Gromadzki, D. Pendergrass, and North Carolina Watermen United).

B. Permanent Injury and Mortality

The Navy's conclusion that underwater noise will result in only "minimal harm" to fish ignores the scientific literature. A number of studies, including one on non-impulsive noise, show that intense sound can kill eggs, larvae, and fry outright or retard their growth in ways that may hinder their survival later.[30] Significant mortality for fish eggs has been shown to occur at distances of 5 meters from an airgun source; mortality rates approaching 50 percent affected yolksac larvae at distances of 2 to 3 meters.[31] With respect to mid-frequency sonar, the Navy itself has noted that "some sonar levels have been shown [in Norwegian studies] to be powerful enough to cause injury to particular size classes of juvenile herring from the water's surface to the seafloor."[32] Also, larvae in at least some species are known to use sound in selecting and orienting toward settlement sites.[33] Acoustic disruption at that stage of development could have significant consequences.[34] Although the Navy acknowledges that eggs and larvae may be more susceptible to sound, it caveats that acknowledgement with the excuse that "more well-controlled studies are needed." DEIS at 3.6-43. However, federal law does not allow the Navy to ignore the valid scientific studies that have already been conducted simply because they are contrary to its interest.

As the Navy is aware after recently completing consultation with both NMFS (for salmon) and the U.S. Fish and Wildlife Service (for bull trout) over its Explosive Ordinance Disposal ("EOD") training exercises in Puget Sound, underwater explosions are responsible for high direct mortality to fish species present in the area. Indeed, the underwater detonation of just five pounds of plastic explosives has been observed to kill over 5,000 fish with swim bladders, with more accurate estimates ranging as high as 20,000 fish. There are a variety of live-fire training exercises, some of which involve underwater explosions of torpedoes and other ordnance that will take place in the GOA. Given the variety of fish and fisheries inhabiting these waters, the Navy's failure to analyze these effects in significant detail is stunning.

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[30] See, e.g., C. Booman, J. Dalen, H. Leivestad, A. Levsen, T. van der Meeren, and K. Toklum, Effecter av luftkanonskyting på egg, larver og yngel (Effects from Airgun Shooting on Eggs, Larvae, and Fry), 3 Fisken og Havet 1-83 (1996) (Norwegian with English summary); J. Dalen and G.M. Knutsen, Scaring Effects on Fish and Harmful Effects on Eggs, Larvae and Fry by Offshore Seismic Explorations, in H.M. Merklinger, Progress in Underwater Acoustics 93-102 (1987); A. Banner and M. Hyatt, Effects of Noise on Eggs and Larvae of Two Estuarine Fishes, 1 Transactions of the American Fisheries Society 134-36 (1973); L.P. Kostyuchenko, Effect of Elastic Waves Generated in Marine Seismic Prospecting on Fish Eggs on the Black Sea, 9 Hydrobiology Journal 45-48 (1973).

[31] Booman et al., Effecter av luftkanonskyting på egg, larver og yngel at 1-83.

[32] Navy, Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the Southern California Range Complex 3.7-66 to 3.7-67 (2008). In the GOA, the Navy would operate sonar at higher levels than those used in the Norwegian studies.

[33] S.D. Simpson, M. Meekan, J. Montgomery, R. McCauley, R., and A. Jeffs, Homeward Sound, 308 Science 221 (2005).

[34] Popper, Effects of Anthropogenic Sounds at 27.

C. Hearing Loss

One series of recent studies showed that passing airguns can severely damage the hair cells of fish (the organs at the root of audition) either by literally ripping them from their base in the ear or by causing them to "explode."[35] Fish, unlike mammals, are thought to regenerate hair cells, but the pink snapper in these studies did not appear to recover within approximately two months after exposure, leading researchers to conclude that the damage was permanent.[36] It is not clear which elements of the sound wave contributed to the injury, or whether repetitive exposures at low amplitudes or a few exposures at higher pressures, or both, were responsible.[37] As with marine mammals, sound has also been shown to induce temporary hearing loss in fish. Even at fairly moderate levels, noise from outboard motor engines is capable of temporarily deafening some species of fish, and other sounds have been shown to affect the short-term hearing of a number of other species, including sunfish and tilapia.[38] For any fish that is dependent on sound for predator avoidance and other key functions, even a temporary loss of hearing (let alone the virtually permanent damage seen in snapper) will substantially diminish its chance of survival.[39]

D. Breeding Behavior

NMFS has observed that the use of mid-frequency sonar could affect the breeding behavior of certain species, causing them, for example, to cease their spawning choruses, much as certain echolocation signals do.[40] The repetitive use of sonar and other active acoustics could thus have significant adverse behavioral effects on some species of fish and those who depend on them.

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[35] R. McCauley, J. Fewtrell, and A.N. Popper, High Intensity Anthropogenic Sound Damages Fish Ears, 113 Journal of the Acoustical Society of America 640 (2003).

[36] Id. at 641 (some fish in the experimental group sacrificed and examined 58 days after exposure).

[37] Id.

[38] A.R. Scholik and H.Y. Yan, Effects of Boat Engine Noise on the Auditory Sensitivity of the Fathead Minnow, Pimephales promelas, 63 Environmental Biology of Fishes 203-09 (2002); A.R. Scholik and H.Y. Yan, The Effects of Noise on the Auditory Sensitivity of the Bluegill Sunfish, Lepomis macrochirus, 133 Comparative Biochemisty and Physiology Part A at 43-52 (2002); M.E. Smith, A.S. Kane, & A.N. Popper, Noise-Induced Stress Response and Hearing Loss in Goldfish (Carassius auratus), 207 Journal of Experimental Biology 427-35 (2003); Popper, Effects of Anthropogenic Sounds at 28.

[39] See Popper, Effects of Anthropogenic Sounds at 29; McCauley et al., High Intensity Anthropogenic Sound Damages Fish Ears, at 641.

[40] Letter from Miles M. Croom, NMFS Southeast Regional Office, to Keith Jenkins, Navy (Jan. 31, 2006); see also J.J. Luczkovich, "Potential Impacts of the U.S. Navy's Proposed Undersea Warfare Training Range on Fishes" (2006) (presentation to Navy).

In sum, the Navy arbitrarily dismisses the potential for adverse impacts on fish. The Navy also capriciously dismisses the notion that fisheries in the area would suffer economic loss, even though – judging by the comments from North Carolina fishermen in 2005 – its training activities appear to have disrupted fishing in the past. Just like the training proposed in North Carolina, the available evidence here underscores the need for a more serious and informed analysis than the Navy currently provides. To comply with the requirements of NEPA, the Navy should rigorously analyze the potential for behavioral, auditory, and physiological impacts on fish, including the potential for population-level effects, using models of fish distribution and population structure and conservatively estimating areas of impact from the available literature. 40 C.F.R. § 1502.22. The Navy must also meaningfully assess the economic consequences of reduced catch rates on commercial and recreational fisheries (as well as on marine mammal foraging) in the GOA. It should also consider avoiding essential fish habitat, spawning grounds and other areas of important habitat for fish species, especially hearing specialists. Notably, as with marine mammals, the Navy does not consider exclusion of important fish habitat or fisheries in the TMAA.

IV. The Navy's Proposed Mitigation Measures Fail to Protect Marine Wildlife

To comply with NEPA, an agency must discuss measures designed to mitigate its project's impact on the environment. *See* 40 C.F.R. § 1502.14(f). There is a large and growing set of options for the mitigation of noise impacts to marine mammals and other marine life, some of which have been imposed by foreign navies[41]—and by the Navy itself, in other contexts—to limit harm from high-intensity sonar exercises. Yet here the Navy does little more than set forth an abbreviated set of measures, dismissing effective measures out of hand.

All of the mitigation that the Navy has proposed for sonar impacts boils down to the following: a very small safety zone around the sonar source, maintained primarily with visual monitoring by personnel with other responsibilities, with aid from shipboard passive monitoring when personnel are already using such technology. Under the proposed scheme, operators would power-down the system if a marine mammal is detected within 1,000 yards and shut-down the system if a marine mammal is detected within 200 yards. DEIS at 5-8 to 13.

This mitigation scheme disregards the best available science on the significant limits of visual monitoring. Visual detection rates for marine mammals generally approach only 5 percent. Moreover, the species perhaps most vulnerable to sonar-related injuries, beaked whales, are among the most difficult to detect because of their small size and diving behavior. It has been estimated that in anything stronger than a light breeze, only one in fifty beaked whales surfacing in the direct track line of a ship would be

[41] See S.J. Dolman, C.R. Weir, and M. Jasny, Comparative Review of Marine Mammal Guidance Implemented during Naval Exercises, __ Marine Pollution Bulletin __ (Dec. 12, 2008).

sighted; as the distance approaches 1 kilometer, that number drops to zero.[42] Right whales are also notoriously hard to detect, and the Navy plans to train next to critical habitat for the highly endangered North Pacific right whale. Right whales are uniquely vulnerable to ship strikes because they often hover on or near the surface of the water. Due to their dark coloration and lack of a dorsal fin, however, they are difficult to detect. The Navy's reliance on visual observation as the mainstay of its mitigation plan is therefore profoundly misplaced.

Further, the Navy's assurances that it will consider when planning exercises, several conditions that contribute to marine mammal stranding events provides no reassurance. Among the conditions the Navy will "consider" include: (1) areas of 1,000 m depth near a shoreline where there is a rapid change in bathymetry; (2) multiple ships or submarines operating sonar; (3) chokepoints and embayments; and (4) the historical presence of strong surface ducting conditions. DEIS at 5-12 to 13. While we applaud the Navy for recognizing these conditions of concern, NEPA requires more. The Navy must impose concrete mitigation measures rather than rhetorical issues of concern.

The Navy's ineffective mitigation measures are all the more remarkable given its adoption of more protective measures during previous training. For example, the Atlantic Fleet has repeatedly sited exercises beyond the continental shelf and Gulf Stream, relocated exercises out of important habitat and to avoid certain species, and used a technique called "simulated geography" to avoid canyons and near-shore areas on at least three of its major ranges. It has also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time.[43]

In this light, the Navy's claims that it cannot implement more protective mitigation measures ring false. DEIS at 5-28 to 41. Although the Navy goes to some pain to describe "alternative mitigation measures considered but eliminated" —primarily for "training effectiveness" reasons—its previous adoption of the same measures belies its argument. Clearly the Navy has done more to mitigate the harmful effects of sonar in previous exercises than what it proposes for the GOA. It can, and must, do more to mitigate the harm on marine wildlife.

A. Protection Zones

As discussed above, there is scientific consensus that geographic mitigation represents the most effective means currently available to reduce the impacts of mid-frequency

[42] J. Barlow and R. Gisiner, Mitigating, Monitoring, and Assessing the Effects of Anthropogenic Noise on Beaked Whales, 7 Journal of Cetacean Research and Management 239-249 (2006).

[43] Final Comprehensive Overseas Environmental Assessment for Major Atlantic Fleet Training Exercises February 2006, Prepared for United States Fleet Forces Command in accordance with Chief of Naval Operations Instruction 5090.1B pursuant to Executive Order 12114; *See also* Atlantic Fleet Exercises Using Mid-Frequency Sonar Mitigation Chart.

sonar on marine mammals.[44] The Navy should obtain additional data on marine mammal density and distribution in the TMAA, which would serve as a basis for predictive habitat modeling. Based on that additional information, the Navy should consider adopting protection zones in the GOA where sonar activity will be banned.

B. Mitigation of Navy Debris and Expended Material

The DEIS fails to set forth any mitigation measures concerning the massive amount of discarded debris and expended materials associated with the increased training in the GOA. The Navy claims that ocean currents will rapidly disperse the expended materials and thus no mitigation is required. "In NEPA's demand that an agency prepare a detailed statement on 'any adverse environmental effects which cannot be avoided should the proposal be implemented,' is an understanding that the EIS will discuss the extent to which adverse effects can be avoided." *Robertson*, 490 U.S. at 352-53. The Navy's "all-or-nothing approach" is not a sufficient discussion of how the adverse impacts of expended material can be avoided. By failing to explore mitigation measures for expended materials, the Navy does not even attempt to avoid, minimize, rectify, reduce, or compensate for its dumping of debris – all of which are options included in the CEQ regulation's definition of "mitigation." 40 C.F.R. § 1508.20.

C. Other Mitigation Measures

In addition to considering protection zones and mitigation for expended materials, the Navy should adopt the following measures:

1) Seasonal avoidance of marine mammal feeding grounds, calving grounds, and migration corridors;

2) Avoidance of, or extra protections in, marine protected areas;

3) Avoidance of bathymetry likely to be associated with high-value habitat for species of particular concern, including submarine canyons and large seamounts, or bathymetry whose use poses higher risk to marine species;

4) Avoidance of fronts and other major oceanographic features, such as areas with marked differentials in sea surface temperatures, which have the potential to attract offshore concentration of animals, including beaked whales;[45]

5) Avoidance of areas with higher modeled takes or with high-value habitat for particular species;

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[44] Supra, note 4.

[45] See, e.g., Carretta et al., U.S. Pacific Marine Mammal Stock Assessments: 2007 at 142 (reporting that "Baird's beaked whales have been seen primarily along the continental slope from late spring to early fall.").

6) Concentration of exercises to the maximum extent practicable in abyssal waters and in surveyed offshore habitat of low value to species;

7) Use of sonar and other active acoustic systems at the lowest practicable source level, with clear standards and reporting requirements for different testing and training scenarios;

8) Expansion of the marine species "safety zone" to a 4km shutdown, reflecting international best practice, or 2 km, reflecting the standard prescribed by the California Coastal Commission;[46]

9) Suspension of relocation of exercises when beaked whales or significant aggregations of other species are detected by any means within the orbit circle of an aerial monitor or near the vicinity of an exercise;

10) Use of simulated geography (and other work-arounds) to reduce or eliminate chokepoint exercises in near-coastal environments, particularly within canyons and channels, and use of other important habitat;

11) Avoidance or reduction of training during months with historically significant surface ducting conditions, and use of power-downs during significant surface ducting conditions at other times;

12) Use of additional power-downs when significant surface ducting conditions coincide with other conditions that elevate risk, such as during exercises involving the use of multiple systems or in beaked whale habitat;

13) Planning of ship tracks to avoid embayments and provide escape routes for marine animals;

14) Suspension or postponement of chokepoint exercises during surface ducting conditions and scheduling of such exercises during daylight hours;

15) Use of dedicated aerial monitors during chokepoint exercises, major exercises, and near-coastal exercises;

16) Use of dedicated passive acoustic monitoring to detect vocalizing species, through established and portable range instrumentation and the use of hydrophone arrays off instrumented ranges;

17) Modification of sonobuoys for passive acoustic detection of vocalizing species;

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[46] California Coastal Commission, Adopted Staff Recommendation on Consistency Determination CD-08606 (2007); Approved Letter from M. Delaplaine, California Coastal Commission, to Rear Adm. Len Hearing, Navy (Jan. 11, 2007).

18) Suspension or reduction of exercises outside daylight hours and during periods of low visibility;

19) Use of aerial surveys and ship-based surveys before, during, and after major exercises;

20) Use of all available range assets for marine mammal monitoring;

21) Use of third-party monitors for marine mammal detection;

22) Establishment of long-term research, to be conducted through an independent agent, on the distribution, abundance, and population structuring of protected species in the GOA, with the goal of supporting adaptive geographic avoidance of high-value habitat. Notably, additional critical habitat is likely to be identified in the GOA, and research should be undertaken to identify this critical habitat;

23) Application of mitigation prescribed by state regulators, by the courts, by other navies or research centers, or by the U.S. Navy in the past or in other contexts;

24) Avoidance of fish spawning grounds and of important habitat for fish species potentially vulnerable to significant behavioral change, such as wide-scale displacement within the water column or changes in breeding behavior;

25) Evaluating before each major exercise whether reductions in sonar use are possible, given the readiness status of the strike groups involved;

26) Dedicated research and development of technology to reduce impacts of active acoustic sources on marine mammals;

27) Establishment of a plan and a timetable for maximizing synthetic training in order to reduce the use of active sonar training;

28) Prescription of specific mitigation requirements for individual classes (or sub-classes) of testing and training activities, in order to maximize mitigation given varying sets of operational needs; and

29) Timely, regular reporting to NOAA, state coastal management authorities, and the public to describe and verify use of mitigation measures during testing and training activities.

Consideration of these measures is minimally necessary to satisfy the requirements of NEPA, and we note that similar or additional measures may be required under the Marine Mammal Protection Act, Endangered Species Act, and other statutes.

V. The Navy Fails to Properly Analyze Cumulative Impacts

In order to satisfy NEPA, an EIS must include a "full and fair discussion of significant environmental impacts." 40 C.F.R. § 1502.1. It is not enough, for purposes of this discussion, to consider the proposed action in isolation, divorced from other public and private activities that impinge on the same resource; rather, it is incumbent on the Navy to assess cumulative impacts as well, including the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future significant actions." *Id.* § 1508.7. A meaningful cumulative impact analysis must identify (1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions—past, present, proposed, and reasonably foreseeable—that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate. *Grand Canyon Trust v. FAA*, 290 F.3d 339, 345 (D.C. Cir. 2002) (quotation and citation omitted). The Navy "cannot treat the identified environmental concern in a vacuum." *TOMAC v. Norton*, 433 F.3d 852, 863 (D.C. Cir. 2006) (*quoting Grand Canyon Trust*, 290 F.3d at 345).

The Navy's cumulative impact analysis fails to meet these basic requirements. Nowhere in its cumulative impact analysis does the Navy consider—let alone reach the conclusion—that the *sum* of the various environmental impacts that are enumerated will be limited. DEIS at 4-1 to 27. The Navy's analysis cannot provide such support because the Navy fails to explain what the sum of these impacts is expected to be. NEPA requires more than just a recital of possible impacts: it requires the Navy to actually analyze the overall impact of the accumulation of individual impacts. *Grand Canyon Trust*, 290 F.3d at 345. The DEIS fails to make this analysis.

The Navy must also consider the full effects of its sonar training. It simply assumes that all behavioral impacts are short-term in nature and cannot affect individuals or populations through repeated activity—even though the anticipated takes at its preferred alternative would affect the same populations.

Nor does the Navy consider the potential for acute synergistic effects from sonar training. Although the DEIS discusses the potential for ship strike in the training area (DEIS 4-20 to 21), it does not consider the greater susceptibility to vessel strike of animals that have been temporarily harassed or disoriented by certain noise sources. The absence of analysis is particularly glaring in light of the Haro Strait incident, in which killer whales and other marine mammals were observed fleeing away from the sonar vessel at high speeds.[47] Neither does the Navy consider the synergistic effects of

[47] Christopher Dunagan, Navy Sonar Incident Alarms Experts, Bremerton Sun, May 8, 2003.

noise with other stressors in producing or magnifying a stress-response.[48] For these reasons alone, the Navy should have concluded that the cumulative and synergistic impacts from sonar training are significant and focused its efforts to analyze and develop mitigation measures to avoid those impacts.

The Navy acknowledges that the GOA is crowded with human and military activities, many of which introduce noise, chemical pollution, debris, and vessel traffic into the habitat of protected species. DEIS at 4-1 to 7; 4-18-27. Yet it inexplicably fails to conclude what the cumulative effects will be for all those activities.

Given the scope of the proposed action, the deficiencies of the Navy's cumulative impacts assessment represents a critical failure of the DEIS. At a minimum, the Navy must evaluate the potential for cumulative impacts on populations that would occur in and near the GOA, clearly define the extent of expected cumulative impacts, and assess the potential for synergistic adverse effects (such as from noise in combination with ship-strikes).

VI. The Navy Fails to Properly Analyze Reasonable Alternatives

NEPA requires agencies to consider alternatives to their proposed actions. To comply with NEPA, an EIS must "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. This alternatives requirement has been described in regulation as "the heart of the environmental impact statement." *Id.* § 1502.14. The courts describe the alternatives requirement equally emphatically, citing it as the "linchpin" of the EIS. *Monroe County Conservation Council v. Volpe*, 472 F.2d 693 (2d Cir. 1972). The agency must therefore "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." 40 C.F.R. § 1502.14(a). Consideration of alternatives is required by (and must conform to the independent terms of) both sections 102(2)(C) and 102(2)(E) of NEPA. Here, the Navy's alternatives analysis misses the mark.

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[48] A.J. Wright, N. Aguilar Soto, A.L. Baldwin, M. Bateson, C.M. Beale, C.Clark, T. Deak, E.F. Edwards, A. Fernández, A. Godinho, L. Hatch, A. Kakuschke, D. Lusseau, D. Martineau, L.M. Romero, L. Weilgart, B. Wintle, G. Notarbartolo di Sciara, and V. Martin, Do marine mammals experience stress related to anthropogenic noise?, 20 International Journal of Comparative Psychology, 274-316 (2007); see also Andrew J. Wright, Natacha Aguilar Soto, Ann L. Baldwin, Melissa Bateson, Colin M. Beale, Charlotte Clark, Terrence Deak, Elizabeth F. Edwards, Antonio Fernández, Ana Godinho, Leila Hatch, Antje Kakuschke, David Lusseau, Daniel Martineau, L. Michael Romero, Linda Weilgart, Brendan Wintle, Giuseppe Notarbartolo-di-Sciara, and Vidal Martin. Anthropogenic noise as a stressor in animals: a multidisciplinary perspective, 20 International Journal of Comparative Psychology, 250-273 (2007).

A. Failure to Identify Environmental Impact-Based Alternatives

The Navy claims it "considers potential environmental impacts" while executing its responsibilities under federal law, including NEPA. DEIS at 1-1. But the Navy's alternatives were not selected to "inform decision-makers and the public" of how the Navy could "avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. Instead, as discussed in the DEIS and below, the Navy chose alternatives based on factors unrelated to the proposed action's environmental impacts.

Further, at no point in the DEIS does the Navy discuss how the alternatives pose different environmental choices for the public and decisionmakers. The DEIS fails entirely to comply with NEPA's regulations, requiring the Navy to "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among option by the decisionmaker and the public." 40 C.F.R. § 1502.14. The Navy fails to sharply define the environmental issues applicable to each alternative and include these differences in a comparison of alternatives. There is simply no comparison of the risks and benefits of each alternative site showing what is and is not known and what species and habitats would be most at risk from each alternative.

B. Identification of Alternative Sites

The DEIS does not include any discussion of alternative sites, instead proposing a No Action alternative (maintaining the current level of activities), Alternative 1 (increasing training activities, including sonar training), and the preferred Alternative 2 (increasing training activities, sonar training, additional strike exercises and range enhancements). The Navy's analysis is devoid of geographic alternatives. The information the Navy does include indicates that factors of convenience and cost dominated the decision. Factors of mere convenience alone cannot dictate an agency's choice of alternatives to evaluate in an EIS. An agency must discuss all reasonable alternatives—those that will accomplish the purpose and need of the agency and are practical and feasible—not simply those it finds most convenient. 40 C.F.R. § 1502.14. "The primary purpose of the impact statement is to compel federal agencies to give serious weight to environmental factors in making discretionary choices." *I-291 Why? Ass'n v. Burns*, 372 F.Supp. 233, 247 (D. Conn. 1974). If an agency is permitted to consider and compare the environmental impacts of its proposed action with only equally convenient alternatives—and permitted to omit from such analysis any alternatives that are less convenient, no matter that they might result in significant environmental benefits—this purpose would be thwarted.

Carefully siting the activities proposed to occur in the range to avoid concentrations of vulnerable and endangered species and high abundances of marine life is the most critical step the Navy can take in reducing the environmental impacts of this project. Because the Navy has failed to undertake an alternatives analysis that allows it to make an informed siting choice, however, the DEIS is inadequate and must be revised.

C. Other Reasonable Alternatives

The DEIS fails to consider any alternatives beyond increasing the level of training. Therefore, many reasonable alternatives are missing from the Navy's analysis that might fulfill that purpose while reducing harm to marine life and coastal resources. For example:

(1) The DEIS fails entirely to consider avoiding seasonal habitat, or any other seasonal variation in marine life abundance (such as migration routes). Omitting even the mere *consideration* of any alternative that recognizes the need to protect endangered and sensitive marine life is unacceptable.

(2) The DEIS fails to include a range of mitigation measures among its alternatives. Many such measures have been employed by the U.S. Navy in other contexts, as discussed above; and there are many others that should be considered. Such measures are reasonable means of reducing harm to marine life and other resources on the proposed range, and their omission from the alternatives analysis renders that analysis inadequate.

(3) The Navy's statement of purpose and need contains no language that would justify the limited set of alternatives that the Navy considers (or the alternative it ultimately prefers). Yet it is a fundamental requirement of NEPA that agencies preparing an EIS specify their project's "purpose and need" in terms that do not exclude full consideration of reasonable alternatives. 40 C.F.R. § 1502.13; *City of Carmel-by-the-Sea v. United States Dep't of Transp.*, 123 F.3d 1142, 1155 (9th Cir. 1997) (*citing Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 196 (D.C. Cir. 1991)). "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate," *Idaho Conservation League v. Mumma*, 956 F.2d 1508, 1519 (9th Cir. 1992), and an EIS errs when it accepts "as a given" parameters that it should have studied and weighed. *Simmons v. U.S. Army Corps of Eng'rs*, 120 F.3d 664, 667 (7th Cir. 1997).

In sum, the DEIS shortchanges or omits from its analysis reasonable alternatives that might achieve the Navy's core aim of testing and training while minimizing environmental harm. For these reasons, we urge the Navy to revise its DEIS to adequately inform the public of all reasonable alternatives that would reduce adverse impacts to whales, fish, and other resources. 40 C.F.R. § 1502.1.

VII. The Navy Fails to Analyze the Impacts on Wildlife Viewing Interests and Recreation

Just as it fails to consider the direct, indirect, and cumulative impacts of increased training in the GOA on the region's marine mammals and other fish and wildlife, the DEIS does not adequately consider the effects on wildlife viewing and other wildlife-

dependent recreational interests. The DEIS makes no mention of the value lost from the harm to marine mammals that attract a number of our organizational members and members of the public to the potentially affected areas of the GOA. Nor does it address the potential economic value lost from decreased tourism (*e.g.*, whale watching, cruise ships, etc.), particularly those areas centered on observing whales and other marine mammals in their natural habitats.

One of NEPA's explicit purposes is to "assure esthetically and culturally pleasing surroundings," 42 U.S.C. 4331(b)(2), and caselaw makes clear that an agency must adequately consider such recreational impacts in its NEPA analysis. *See, e.g., Lujan v. NWF*, 497 U.S. 871, 887 (1990) ("no doubt that recreational use and aesthetic enjoyment are among the sorts of interests NEPA [was] specifically designed to protect"); *LaFlamme v. FERC*, 852 F.2d 389, 401 (1988) (because "there were substantial questions raised regarding whether the project may significantly affect recreational use in the project area, and that FERC failed to explain or discuss" these impacts, the court found that "this record reflects a decision which is neither 'fully informed or well-considered,'" and therefore concluded the agency's decision not to prepare an EIS was unreasonable).

VIII. Project Description and Meaningful Public Disclosure

Disclosure of the specific activities contemplated by the Navy is essential if the NEPA process is to be a meaningful one. *See, e.g., LaFlamme v. F.E.R.C.*, 852 F.2d 389, 398 (9th Cir. 1988) (noting that NEPA's goal is to facilitate "widespread discussion and consideration of the environmental risks and remedies associated with [a proposed action]").

For meaningful public input, the Navy must describe source levels, frequency ranges, duty cycles, and other technical parameters relevant to determining potential impacts on marine life. The DEIS provides some of this information, but it fails to disclose sufficient information about active sonobuoys, acoustic device countermeasures, training targets, or range sources that would be used during the exercises. DEIS at Appendix H. And the DEIS gives no indication of platform speed, pulse length, repetition rate, beam widths, or operating depths—that is, most of the data that the Navy used in modeling acoustic impacts.

The Navy—despite repeated requests—has not released or offered to release CASS/GRAB or any of the other modeling systems or functions it used to develop the biological risk function or calculate acoustic harassment and injury. *See, e.g.,* DEIS at Appendix D.

In addition, the Navy has also ignored repeated Freedom of Information Act requests regarding information and reports cited in the DEIS.

These models, reports, and requests for information must be made available to the public, including the independent scientific community, for public comment to be

meaningful under NEPA and the Administrative Procedure Act. 40 C.F.R. §§ 1502.9(a), 1503.1(a) (NEPA); 5 U.S.C. § 706(2)(D) (APA). In addition, guidelines adopted under the Data (or Information) Quality Act also require their disclosure. The Office of Management and Budget's guidelines require agencies to provide a "high degree of transparency" precisely "to facilitate reproducibility of such information by qualified third parties" (67 Fed. Reg. 8452, 8460 (Feb. 22, 2002)); and the Defense Department's own data quality guidelines mandate that "influential" scientific material be made reproducible as well. We encourage the Navy to contact us immediately to discuss how to make this critical information available.

IX. Compliance With Other Applicable Laws

A number of other statutes and conventions are implicated by the proposed activities. Among those that must be disclosed and addressed during the NEPA process are the following:

(1) The Marine Mammal Protection Act ("MMPA"), 16 U.S.C. § 1361 et seq., which requires the Navy to obtain a permit or other authorization from NMFS or the U.S. Fish and Wildlife Service prior to any "take" of marine mammals. The Navy must apply for an incidental take permit under the MMPA, and NRDC will submit comments regarding the Navy's application to NMFS at the appropriate time.

(2) The Endangered Species Act, 16 U.S.C. § 1531 et seq., which requires the Navy to enter into formal consultation with NMFS or the U.S. Fish and Wildlife Service, and receive a legally valid Incidental Take Permit, prior to its "take" of any endangered or threatened marine mammals or other species, including fish, sea turtles, and birds, or its "adverse modification" of critical habitat. *See, e.g.*, 1536(a)(2); *Romero-Barcelo v. Brown*, 643 F.2d 835 (1st Cir. 1981), *rev'd on other grounds*, *Weinberger v. Romero-Carcelo*, 456 U.S. 304, 313 (1982). Given the scope and significance of the actions and effects it proposes, the Navy must engage in formal consultation with NMFS and the U.S. Fish and Wildlife over the numerous endangered and threatened species in the GOA.

(3) The Coastal Zone Management Act, and in particular its federal consistency requirements, 16 U.S.C. § 1456(c)(1)(A), which mandate that activities that affect the natural resources of the coastal zone—whether they are located "within or outside the coastal zone"—be carried out "in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs." The Navy must fulfill its CZMA commitments along the Alaska coast.

(4) The Magnuson-Stevens Fisheries Conservation and Management Act, 16 U.S.C. § 1801 et seq. ("MSA"), which requires federal agencies to "consult with the Secretary [of Commerce] with respect to any action authorized, funded, or

undertaken, or proposed to be authorized, funded, or undertaken" that "may adversely affect any essential fish habitat" identified under that Act. 16 U.S.C. § 1855 (b)(2). In turn, the MSA defines essential fish habitat as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." 16 U.S.C. § 1802 (10). The GOA contains such habitat. As discussed at length above, anti-submarine warfare exercises alone have the significant potential to adversely affect at least the waters, and possibly the substrate, on which fish in these areas depend. Under the MSA, a thorough consultation is required.

(5) The Marine Protection, Research and Sanctuaries Act, 33 U.S.C. § 1401 et seq., which requires federal agencies to consult with the Secretary of Commerce if their actions are "likely to destroy, cause the loss of, or injure any sanctuary resource." 16 U.S.C. § 1434(d)(1). Since the Navy's exercises would cause injury and mortality of species, consultation is clearly required if sonar use takes place either within or in the vicinity of the sanctuary or otherwise affects its resources. Since sonar may impact sanctuary resources even when operated outside its bounds, the Navy should indicate how close it presently operates, or foreseeably plans to operate, to such sanctuary and consult with the Secretary of Commerce as required.

In addition, the Sanctuaries Act is intended to "prevent or strictly limit the dumping into ocean waters of any material that would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities" (33 U.S.C. § 1401(b)), and prohibits all persons, including Federal agencies, from dumping materials into ocean waters, except as authorized by the Environmental Protection Agency. 33 U.S.C. §§ 1411, 1412(a). The Navy has not indicated its intent to seek a permit under the statute.

(6) The Migratory Bird Treaty Act, 16 U.S.C. § 703 et seq. ("MBTA"), which makes it illegal for any person, including any agency of the Federal government, "by any means or in any manner, to pursue, hunt, take, capture, [or] kill" any migratory birds except as permitted by regulation. 16 U.S.C. § 703. After the District Court for the D.C. Circuit held that naval training exercises that incidentally take migratory birds without a permit violate the MBTA, (see *Center for Biological Diversity v. Pirie*, 191 F. Supp. 2d 161 (D.D.C. 2002) (later vacated as moot)), Congress exempted some military readiness activities from the MBTA but also placed a duty on the Defense Department to minimize harms to seabirds. Under the new law, the Secretary of Defense, "shall, in consultation with the Secretary of the Interior, identify measures-- (1) to minimize and mitigate, to the extent practicable, any adverse impacts of authorized military readiness activities on affected species of migratory birds; and (2) to monitor the impacts of such military readiness activities on affected species of migratory birds." Pub.L. 107-314, § 315 (Dec. 2, 2002). As the Navy acknowledges, many migratory birds occur within the GOA. The Navy must therefore consult with the Secretary of the Interior regarding measures to

minimize and monitor the effects of the proposed range on migratory birds, as required.

(7) Executive Order 13158, which sets forth protections for marine protected areas ("MPAs") nationwide. The Executive Order defines MPAs broadly to include "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." E.O. 13158 (May 26, 2000). It then requires that "[e]ach Federal agency whose actions affect the natural or cultural resources that are protected by an MPA shall identify such actions," and that, "[t]o the extent permitted by law and to the maximum extent practicable, each Federal agency, in taking such actions, shall avoid harm to the natural and cultural resources that are protected by an MPA." *Id.* The Navy must therefore consider and, to the maximum extent practicable, must avoid harm to the resources of all federally- and state-designated marine protected areas.

The proposed activities also implicate the Clean Air Act and Clean Water Act as well as other statutes protecting the public health. The Navy must comply with these and other laws.

X. Conflicts with Federal, State and Local Land-Use Planning

NEPA requires agencies to assess possible conflicts that their projects might have with the objectives of federal, regional, state, and local land-use plans, policies, and controls. 40 C.F.R. § 1502.16(c). The Navy's training and testing activities may affect resources in the coastal zone and within other state and local jurisdictions, in conflict with the purpose and intent of those areas. The consistency of Navy operations with these land-use policies must receive more thorough consideration.

Mrs. Amy Burt
January 25, 2010
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APPENDIX B

IMPACTS OF SONAR

Strandings and Mortalities Associated with Sonar

Scientists agree, and the publicly available scientific literature confirms, that the intense sound generated by active sonar can induce a range of adverse effects in whales and other species, from significant behavioral changes to stranding and death. By far the most widely-reported and dramatic of these effects are the mass strandings of beaked whales and other marine mammals that have been associated with military sonar use.

Over the last decade, the association between military active sonar and whale mortalities has become a subject of considerable scientific interest and concern. That interest is reflected in the publication of numerous papers in peer-reviewed journals, in reports by inter-governmental bodies such as the IWC's Scientific Committee, and in evidence compiled from a growing number of mortalities associated with sonar. Yet the DEIS only glosses over these stranding incidents.

In March 2000, for example, sixteen whales from at least three species— including two minke whales—stranded over 150 miles of shoreline along the northern channels of the Bahamas. The beachings occurred within 24 hours of Navy ships using mid-frequency sonar in those same channels.[49] Post-mortem examinations found, in all whales examined, hemorrhaging in and around the ears and other tissues related to sound conduction or production, such as the larynx and auditory fats, some of which was debilitative and potentially severe.[50] It is now accepted that these mortalities were caused, through an unknown mechanism, by the Navy's use of mid-frequency sonar.

The Bahamas event is merely one of numerous mortality events coincident with military activities and active sonar that have now been documented, only some of which the Navy discusses:[51]

> (1) Canary Islands 1985-1991 – Between 1985 and 1989, at least three separate mass strandings of beaked whales occurred in the Canary Islands, as reported in *Nature*.[52] Thirteen beaked whales of two species were killed in the

[49] Commerce and Navy, Joint Interim Report at iii, 16.

[50] Id.

[51] The following is not a complete list, as other relevant events have been reported in Bonaire, Japan, Taiwan, and other locations. See, e.g., R.L. Brownell, Jr., T. Yamada, J.G. Mead, and A.L. van Helden, Mass Strandings of Cuvier's Beaked Whales in Japan: U.S. Naval Acoustic Link? (2004) (IWC SC/56E37); J.Y. Wang and S.-C. Yang, Unusual Cetacean Stranding Events of Taiwan in 2004 and 2005, 8 Journal of Cetacean Research and Management 283-292 (2006); P.J.H. van Bree and I. Kristensen, On the Intriguing Stranding of Four Cuvier's Beaked Whales, Ziphius cavirostris, G. Cuvier, 1823, on the Lesser Antillean Island of Bonaire, 44 Bijdragen tot de Dierkunde 235-238 (1974).

[52] M. Simmonds and L.F. Lopez-Jurado, Whales and the Military, 337 Nature 448 (1991).

February 1985 strandings, six whales of three species stranded in November 1988, and some twenty-four whales of three species stranded in October 1989—all while naval vessels were conducting exercises off shore.[53] An additional stranding of Cuvier's beaked whales, also coinciding with a naval exercise, occurred in 1991.[54] It was reported that mass live strandings occurred each time exercises took place in the area.[55]

(2) Greece 1996, 1997 – In 1996, twelve Cuvier's beaked whales stranded along 35 kilometers on the west coast of Greece. The strandings were correlated, by an analysis published in *Nature*, with the test of a low- and mid-frequency active sonar system operated by NATO.[56] A subsequent NATO investigation found the strandings to be closely timed with the movements of the sonar vessel, and ruled out all other physical environmental factors as a cause.[57] The following year saw nine additional Cuvier's beaked whales strand off Greece, again coinciding with naval activity.[58]

(3) Virgin Islands 1999 – In October 1999, four beaked whales stranded in the U.S. Virgin Islands as the Navy began an offshore exercise. A wildlife official from the Islands reported the presence of "loud naval sonar."[59] When NMFS asked the Navy for more information about its exercise, the Department's response was to end the consultation that it had begun for the exercise under the Endangered Species Act.[60] In January 1998, according to a NMFS biologist, a beaked whale "stranded suspiciously" at Vieques as naval exercises were set to commence offshore.[61]

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[53] Id.

[54] V. Martín, A. Servidio, and S. Garcia, Mass Strandings of Beaked Whales in the Canary Islands, in P.G.H. Evans and L.A. Miller, Proceedings of the Workshop on Active Sonar and Cetaceans 33-36 (2004).

[55] Simmonds and Lopez-Jurado, Whales and the Military, 337 Nature at 448.

[56] A. Frantzis, Does Acoustic Testing Strand Whales? 392 Nature 29 (1998).

[57] See SACLANT Undersea Research Center, Summary Record, La Spezia, Italy, 15-17 June 1998, SACLANTCEN Bioacoustics Panel, SACLANTCEN M-133 (1998).

[58] Id.; A. Frantzis, The First Mass Stranding That Was Associated with the Use of Active Sonar (Kyparissiakos Gulf, Greece, 1996), in P.G.H. Evans and L.A. Miller, Proceedings of the Workshop on Active Sonar and Cetaceans 14-20 (2004).

[59] Personal communication of Dr. David Nellis, U.S. Virgin Island Department of Fish and Game, to Eric Hawk, NMFS (Oct. 1999); personal communication from Ken Hollingshead, NMFS, to John Mayer, Marine Acoustics Inc. (March 19, 2002).

[60] Letter from William T. Hogarth, Regional Administrator, NMFS Southeast Regional Office, to RADM J. Kevin Moran, Navy Region Southeast (undated); personal communication from Ken Hollingshead, NMFS, to John Mayer, Marine Acoustics Inc. (March 19, 2002).

[61] Personal communication from Eric Hawk, NMFS, to Ken Hollingshead, NMFS (Feb. 12, 2002).

(4) Bahamas 2000 – As described above.

(5) Madeira 2000 -- In May 2000, four beaked whales stranded on the beaches of Madeira while several NATO ships were conducting an exercise near shore. Scientists investigating the stranding found that the whales' injuries—including "blood in and around the eyes, kidney lesions, pleural hemorrhage"—and the pattern of their stranding suggest "that a similar pressure event [*i.e.*, similar to that at work in the Bahamas] precipitated or contributed to strandings in both sites."[62]

(6) Canary Islands 2002 – In September 2002, at least fourteen beaked whales from three different species stranded in the Canary Islands. Four additional beaked whales stranded over the next several days.[63] The strandings occurred while a Spanish-led naval exercise that included U.S. Navy vessels and at least one ship equipped with mid-frequency sonar was conducting anti-submarine warfare exercises in the vicinity.[64] The subsequent investigation, as reported in the journals *Nature* and *Veterinary Pathology*, revealed a variety of traumas, including emboli and lesions suggestive of decompression sickness.[65]

(7) Washington 2003 – In May 2003, the U.S. Navy vessel USS *Shoup* was conducting a mid-frequency sonar exercise while passing through Haro Strait, between Washington's San Juan Islands and Canada's Vancouver Island. According to one contemporaneous account, "[d]ozens of porpoises and killer whales seemed to stampede all at once . . . in response to a loud electronic noise echoing through" the Strait.[66] Several field biologists present at the scene reported observing a pod of endangered orcas bunching near shore and engaging in very abnormal behavior consistent with avoidance, a minke whale "porpoising" away from the sonar ship, and Dall's porpoises fleeing the vessel in large numbers.[67] Eleven harbor porpoises—an abnormally high number

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[62] D.R. Ketten, Beaked Whale Necropsy Findings 22 (2002) (paper submitted to NMFS); L. Freitas, The Stranding of Three Cuvier's Beaked Whales Ziphius Cavirostris in Madeira Archipelago—May 2000, in P.G.H. Evans and L.A. Miller, Proceedings of the Workshop on Active Sonar and Cetaceans 28-32 (2004).

[63] Vidal Martin et al., Mass Strandings of Beaked Whales in the Canary Islands, in Proceedings of the Workshop on Active Sonar and Cetaceans 33 (P.G.H. Evans & L.A. Miller eds., 2004); Fernández et al., 'Gas and Fat Embolic Syndrome', 42 Veterinary Pathology at 446-57.

[64] Fernández et al., 'Gas and Fat Embolic Syndrome', 42 Veterinary Pathology at 446; K.R. Weiss, Whale Deaths Linked to Navy Sonar Tests, L.A. Times, Oct. 1, 2002, at A3.

[65] Fernández et al., 'Gas and Fat Embolic Syndrome', 42 Veterinary Pathology at 446-57; Jepson et al., Gas-Bubble Lesions, 425 Nature at 575-76.

[66] Christopher Dunagan, Navy Sonar Incident Alarms Experts, Bremerton Sun, May 8, 2003.

[67] NMFS, Assessment of Acoustic Exposures at 6, 9.

given the average stranding rate of six per year—were found beached in the area of the exercise.[68]

(8) Kauai 2004 – During the Navy's conduct of a major training exercise off Hawaii, called RIMPAC 2004, some 150-200 whales from a species that is rarely seen near shore and had never naturally mass-stranded in Hawaii came into Hanalei Bay, on the island of Kaua'i. The whales crowded into the shallow bay waters and milled there for over 28 hours. Though the whales were ultimately assisted into deeper waters by members of a local stranding network, one whale calf was left behind and found dead the next day. NMFS undertook an investigation of the incident and concluded that the Navy's nearby use of sonar in RIMPAC 2004 was the "plausible, if not likely" cause of the stranding.[69]

(9) Canary Islands 2004 – In July 2004, four dead beaked whales were found around the coasts of the Canary Islands, within one week of an NATO exercise. The exercise, Majestic Eagle 2004, was conducted approximately 100 kilometers north of the Canaries. Although the three whale bodies that were necropsied were too decomposed to allow detection of gas embolisms, systematic fat embolisms were found in these animals.[70] The probability that the whales died at sea is extremely high.[71]

(10) North Carolina 2005 – During and just after a U.S. training exercise off North Carolina, at least thirty-seven whales of three different species stranded and died along the Outer Banks, including numerous pilot whales (six of which were pregnant), one newborn minke whale, and two dwarf sperm whales. NMFS investigated the incident and found that the event was highly unusual,

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[68] NMFS, Preliminary Report: Multidisciplinary Investigation of Harbor Porpoises (Phocoena phocoena) Stranded in Washington State from 2 May – 2 June 2003 Coinciding with the Mid-Range Sonar Exercises of the USS Shoup 53-55 (2004) (conclusions unchanged in final report). Unfortunately, according to the report, freezer artifacts and other problems incidental to the preservation of tissue samples made the cause of death in most specimens difficult to determine; but the role of acoustic trauma could not be ruled out. Id.

[69] B.L. Southall, R. Braun, F.M.D. Gulland, A.D. Heard, R.W. Baird, S.M. Wilkin, and T.K. Rowles, Hawaiian Melon-Headed Whale *(Peponacephala electra)* Mass Stranding Event of July 3-4, 2004 (2006) (NOAA Tech. Memo. NMFS-OPR-31); See also R.L. Brownell, Jr., K Ralls, S. Baumann-Pickering and M.M. Poole, Behavior of melon-headed whales, *Pepnoncephalia electra*, near oceanic islands, Marine Mammal Science, (publication pending 2009).

[70] A. Espinosa, M. Arbelo, P. Castro, V. Martín, T. Gallardo, and A. Fernández, New Beaked Whale Mass Stranding in Canary Islands Associated with Naval Military Exercises (Majestic Eagle 2004) (2005) (poster presented at the European Cetacean Society Conference, La Rochelle, France, April 2005); A. Fernández, M. Méndez, E. Sierra, A. Godinho, P. Herráez, A. Espinosa de los Monteros, F. Rodríguez, F., and M. Arbelo, M., New Gas and Fat Embolic Pathology in Beaked Whales Stranded in the Canary Islands (2005) (poster presented at the European Cetaecan Society Conference, La Rochelle, France, April 2005).

[71] Id.

being the only mass stranding of offshore species ever to have been reported in the region, and that it shared 'a number of features' with other sonar-related mass stranding events (involving offshore species which stranded alive and were atypically distributed along the shore). NMFS concluded that sonar was a possible cause of the strandings and also ruled out the most common other potential causes, including viral, bacterial, and protozoal infection, direct blunt trauma, and fishery interactions.[72]

(11) Spain 2006 – Four Cuvier's beaked whales stranded on the Almerian coast of southern Spain, with the same suite of bends-like pathologies seen in the whales that stranded in the Canary Islands in 2002 and 2004.[73] A NATO response force was performing exercises within 50 miles at the time of the strandings.

Some observations can be drawn from these incidents. For example, beaked whales, a group of deep-water species that are seldom seen and may in some cases be extremely rare, seem to be particularly vulnerable to the effects of active sonar. A 2000 review undertaken by the Smithsonian Institution, and reported and expanded by the IWC's Scientific Committee and other bodies, supports this conclusion, finding that every mass stranding on record involving multiple species of beaked whales has occurred with naval activities in the vicinity.[74] Indeed, it is not even certain that some beaked whale species naturally strand in numbers.

But the full magnitude of sonar's effects on these species—or on other marine mammals—is not known. Most of the world lacks networks to identify and investigate stranding events, particularly those that involve individual animals spread out over long stretches of coastline, and therefore the mortalities that have been identified thus far are likely to represent only a subset of a substantially larger problem. For example, most beaked whale casualties (according to NMFS) are bound to go undocumented because of the remote siting of sonar exercises and the small chance that a dead or injured animal would actually strand.[75] It is well understood in terrestrial ecology that dead and dying animals tend to be grossly undercounted given their rapid assimilation into the environment, and one would of course expect profound difficulty where offshore

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[72] A.A. Hohn, D.S. Rotstein, C.A. Harms, and B.L. Southall, Multispecies Mass Stranding of Pilot Whales (Globicephala macrorhynchus), Minke Whale (*Balaenoptera acutorostrata*), and Dwarf Sperm Whales (*Kogia sima*) in North Carolina on 15-16 January 2005 (2006) (NOAA Tech. Memo. NMFS-SEFSC-53).

[73] International Whaling Commission, Report of the Scientific Committee, Annex K at 28 (2006) (IWC/ 58/Rep1).

[74] Marine Mammal Program of the National Museum of Natural History, Historical Mass Mortalities of Ziphiids 2-4 (Apr. 6, 2000); see also 2 J. Cetacean Res. & Mgmt., Supp., Annex J at § 13.8 (2000) (report of the IWC Scientific Committee, Standing Working Group on Environmental Concerns).

[75] J.V. Carretta, K.A. Forney, M.M. Muto, J. Barlow, J. Baker, and M. Lowry, U.S. Pacific Marine Mammal Stock Assessments: 2006 (2007).

marine species are concerned.[76] Along the eastern seaboard and in the Gulf of Mexico, all beaked whale sightings during NMFS shipboard surveys have occurred at considerable distances from shore.[77]

Furthermore, although the physical process linking sonar to strandings is not perfectly understood, the record indicates that debilitating and very possibly lethal injuries are occurring in whales exposed to sonar at sea—only some of which may then strand. As first reported in the journal *Nature*, animals that came ashore during sonar exercises off the Canary Islands, in September 2002, had developed large emboli in their organ tissue and suffered from symptoms resembling those of severe decompression sickness, or "the bends."[78] It has been proposed that the panic led them to surface too rapidly or pushed them to dive before they could eliminate the nitrogen accumulated on previous descents. This finding has since been supported by follow-on papers, by published work in other fields, and by expert reviews.[79] In any case, the evidence is considered "compelling" that acoustic trauma, or injuries resulting from behavioral responses, has in some way led to the deaths of these animals.[80]

Other Harmful Effects of Sonar

Strandings and mass mortalities, though an obvious focus of much reporting and concern, are likely only the tip of the iceberg of sonar's harmful effects. Marine mammals are believed to depend on sound to navigate, find food, locate mates, avoid

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[76] See, e.g., G. Wobeser, Investigation and Management of Disease in Wild Animals 13-15 (1994); P.A. Alison, C.R. Smith, H. Kukert, J.W. Deming, B.A. Bennett, Deep-Water Taphonomy of Vertebrate Carcasses: A Whale Skeleton in the Bathyal Santa Catalina Basin, 17 Paleobiology 78-89 (1991).

[77] G.T. Waring, E. Josephson, C.P. Fairfield, and K. Maze-Foley, eds., U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments—2006 at 232-33, 238, 288, 292, 296 (2007) (NOAA Tech. Memo. NMFS NE 201) (data from NMFS surveys, showing all beaked whales sightings at significant distances from shore).

[78] See P.D. Jepson, M. Arbelo, R. Deaville, I.A.P. Patterson, P. Castro, J.R. Baker, E. Degollada, H.M. Ross, P. Herráez, A.M. Pocknell, F. Rodríguez, F.E. Howie, A. Espinosa, R.J. Reid, J.R. Jaber, V. Martín, A.A. Cunningham, A. Fernández, Gas-Bubble Lesions in Stranded Cetaceans, 425 Nature 575-576 (2003); Fernández et al., 'Gas and Fat Embolic Syndrome', 42 Veterinary Pathology at 415.

[79] E.g., Cox et al., Understanding the Impacts. Of course it would be a mistake to assume that an animal must suffer bends-like injury or some other sort of acoustic trauma in order to strand. Some may die simply because the noise disorients them, for instance. See, e.g., NMFS, Assessment of Acoustic Exposures at 9-10.

[80] Cox et al., Understanding the Impacts; see also P.G.H. Evans and L.A. Miller, Concluding Remarks, in Proceedings of the Workshop on Active Sonar and Cetaceans 74 (2004); K.C. Balcomb and D.E. Claridge, A Mass Stranding of Cetaceans Caused by Naval Sonar in the Bahamas, 8(2) Bahamas Journal of Science 1 (2001); D.E. Claridge, Fine-Scale Distribution and Habitat Selection of Beaked Whales (2006) (M.Sc. thesis); E.C.M. Parsons, S.J. Dolman, A.J. Wright, N.A. Rose, and W.C.G. Burns, Navy Sonar and Cetaceans: Just How Much Does the Gun Need to Smoke before We Act? 56 Marine Pollution Bulletin 1248 (2008).

predators, and communicate with each other. Flooding their habitat with man-made, high-intensity noise interferes with these and other functions. In addition to strandings and non-auditory injuries, the harmful effects of high-intensity sonar include:

- temporary or permanent loss of hearing, which impairs an animal's ability to communicate, avoid predators, detect and capture prey, and avoid ship strikes;
- avoidance behavior, which can lead to abandonment of habitat or migratory pathways;
- disruption of biologically important behaviors such as mating, feeding, nursing, or migration, or loss of efficiency in conducting those behaviors;
- aggressive (or agonistic) behavior, which can result in injury;
- masking of biologically meaningful sounds, such as the call of predators or potential mates;
- chronic stress, which can compromise viability, suppress the immune system, and lower the rate of reproduction;
- habituation, causing animals to remain near damaging levels of sound, or sensitization, exacerbating other behavioral effects; and
- declines in the availability and viability of prey species, such as fish and shrimp.

Over the past 20 years, a substantial literature has emerged documenting the range of effects of ocean noise on marine mammals.[81]

Marine mammals are not the only species affected by undersea noise. Impacts on fish are of increasing concern due to several recent studies demonstrating hearing loss and widespread behavioral disruption in commercial species of fish and to reports, both experimental and anecdotal, of catch rates plummeting in the vicinity of noise sources. Further, the death of species not protected by federal law reduces prey available to listed species. And noise has been shown in several cases to kill, disable, or disrupt the behavior of invertebrates, many of which possess ear-like structures or other sensory mechanisms that could leave them vulnerable. It is clear that intense sources of noise are capable of affecting a wide class of ocean life.

[81] For a review of research on behavioral and auditory impacts of undersea noise, see, e.g., L.S. Weilgart, The Impacts of Anthropogenic Ocean Noise on Cetaceans and Implications for Management, 85 Canadian Journal of Zoology 1091-1116 (2007); W.J. Richardson, C.R. Greene, Jr., C.I. Malme, and D.H. Thomson, Marine Mammals and Noise (1995); National Research Council, Ocean Noise and Marine Mammals (2003); Whale and Dolphin Conservation Society, Oceans of Noise (2004).

APPENDIX C

CRITIQUE OF THE NAVY'S ACOUSTICS ANALYSIS

We urge the Navy to substantially alter the approach it has taken thus far. The Navy must revise its acoustic impact analysis to reflect the evidence of mid-frequency sonar's effects on marine life. Unfortunately, the Navy's current assessment of acoustic impacts disregards a great deal of relevant information adverse to its interests, uses approaches and methodologies that would not be acceptable to the scientific community, and ignores whole categories of impacts. Before issuing a final EIS, the Navy should (1) reduce its thresholds or risk function for marine mammal injury, hearing loss, and significant behavioral change, in accordance with the available science; (2) address the considerable scientific record that has developed around sonar and whale injury and mortality; and (3) revise its impact assessment model to take account of complex sound fields, synergistic effects from multiple sound sources, and the presence of vulnerable populations in the TMAA such as the North Pacific right whale, blue whale, fin whale, humpback whale, sei whale, sperm whale and Steller sea lion.

Thresholds of Injury, Hearing Loss and Behavioral Change

At the core of the Navy's assessment of acoustic impacts are the thresholds it has established for physiological and behavioral effects. There are gross problems with the Navy's thresholds, as discussed below.

1. Permanent Threshold Shift

The Navy sets the threshold for permanent threshold shift ("PTS"), which is the highest threshold for direct physical injury, at 215 dB re 1 μPa^{2}•s for cetaceans; 266 dB re 1 μPa^{2}•s for California sea lions, Steller sea lions, and Northern fur seals; and 224 dB re 1 μPa^{2}•s for Northern elephant seals. DEIS at 3.8-90. These thresholds are inconsistent with the scientific literature.

For instance, the Navy disregards data gained from actual whale mortalities. The best available scientific evidence, as reported in the peer-reviewed literature, indicates that sound levels at the most likely locations of beaked whales beached in the Bahamas strandings run far lower than the Navy's threshold for injury here: approximately 150-160 dB re 1 µPa for 50-150 seconds, over the course of the transit.[82] A further modeling effort, undertaken in part by the Office of Naval Research, suggests that the mean exposure level of beaked whales, given their likely distribution in the Bahamas' Providence Channels and averaging results from various assumptions, may have been

[82] J. Hildebrand, "Impacts of Anthropogenic Sound," in T.J. Ragen, J.E. Reynolds III, W.F. Perrin, and R.R. Reeves, Conservation beyond Crisis (2005). See also International Whaling Commission, 2004 Report of the Scientific Committee, Annex K at § 6.3.

lower than 140 dB re 1 µPa.[83] Factoring in duration, then, evidence of actual sonar-related mortalities would compel a *maximum* energy level threshold for serious injury on the order of 182 dB re 1 μPa^{2}*s, at least for beaked whales. Indeed, to pay at least some deference to the literature, the Navy—under pressure from NMFS—has previously assumed that non-lethal injury would occur in beaked whales exposed above 173 dB re 1 μPa^{2}*s.[84]

In addition, the DEIS glosses over – in a single paragraph – published research on bubble growth in marine mammals, which separately indicates the potential for injury and death at levels far lower than what the Navy proposes. DEIS at 3.8-94. According to the best available scientific evidence, as represented by multiple papers in flagship journals such as *Nature* and *Veterinary Pathology*, gas bubble growth is the causal mechanism most consistent with the observed injuries;[85] in addition, it was singularly and explicitly highlighted as plausible by an expert panel convened by the Marine Mammal Commission, in which the Navy participated.[86] The Navy concedes that "a popular hypothesis regarding a potential cause of [marine mammal] strandings is that tissue damage results from a 'gas and fat embolic syndrome'" (DEIS at 3.8-94), but then fails to actually evaluate the potential impacts. NEPA requires agencies to evaluate all "reasonably foreseeable" impacts, which, by definition, include "impacts which have catastrophic consequences, even if their probability of occurrence is low, provided that the analysis of the impacts is supported by credible scientific evidence, is not based on pure conjecture, and is within the rule of reason." 40 C.F.R. § 1502.22. The scientific literature supporting bubble growth rises far above this standard, and the Navy's failure to incorporate it into its impact model is arbitrary and capricious. Thus, the Navy's refusal to consider these impacts is insupportable under NEPA. 40 C.F.R. §§ 1502.22, 1502.24.

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[83] J. Hildebrand, K. Balcomb, and R. Gisiner, Modeling the Bahamas Beaked Whale Stranding of March 2000 (2004) (presentation given at the third plenary meeting of the U.S. Marine Mammal Commission Advisory Committee on Acoustic Impacts on Marine Mammals, 29 July 2004).

[84] See, e.g., Navy, Joint Task Force Exercises and Composite Training Unit Exercises Final Environmental Assessment/ Overseas Environmental Assessment at 4-44, 4-46 to 4-47 (2007).

[85] See, e.g., A. Fernández, J.F. Edwards, F. Rodríguez, A. Espinosa de los Monteros, P. Herráez, P. Castro, J.R. Jaber, V. Martín, and M. Arbelo, 'Gas and Fat Embolic Syndrome' Involving a Mass Stranding of Beaked Whales (Family Ziphiidae) Exposed to Anthropogenic Sonar Signals, 42 Veterinary Pathology 446 (2005); P.D. Jepson, M. Arbelo, R. Deaville, I.A.P. Patterson, P. Castro, J.R. Baker, E. Degollada, H.M. Ross, P. Herráez, A.M. Pocknell, F. Rodríguez, F.E. Howie, A. Espinosa, R.J. Reid, J.R. Jaber, V. Martín, A.A. Cunningham, and A. Fernández, Gas-Bubble Lesions in Stranded Cetaceans, 425 Nature 575-576 (2003); R.W. Baird, D.L. Webster, D.J. McSweeney, A.D. Ligon, G.S. Schorr, and J. Barlow, Diving Behavior of Cuvier's (Ziphius cavirostris) and Blainville's (Mesoplodon densirostris) Beaked Whales in Hawai'i," 84 Canadian Journal of Zoology 1120-1128 (2006).

[86] T.M. Cox, T.J. Ragen, A.J. Read, E. Vos, R.W. Baird, K. Balcomb, J. Barlow, J. Caldwell, T. Cranford, L. Crum, A. D'Amico, G. D'Spain, A. Fernández, J. Finneran, R. Gentry, W. Gerth, F. Gulland, J. Hildebrand, D. Houser, T. Hullar, P.D. Jepson, D. Ketten, C.D. MacLeod, P. Miller, S. Moore, D. Mountain, D. Palka, P. Ponganis, S. Rommel, T. Rowles, B. Taylor, P. Tyack, D. Wartzok, R. Gisiner, J. Mead, and L. Benner, Understanding the Impacts of Anthropogenic Sound on Beaked Whales, 7 Journal of Cetacean Research & Management 177-87 (2006).

Finally, the Navy's exclusive reliance on energy flux density levels ("ELs") as a unit of analysis is misplaced. DEIS at 3.8-91 to 93. It is appropriate for the Navy to set dual thresholds for behavioral effects, one based on ELs and one based on sound exposure levels ("SELs").

2. Temporary Threshold Shift

The DEIS sets its threshold for temporary hearing loss and behavioral effects, or "temporary threshold shift" ("TTS"), at 195 dB re 1 μPa^{2}•s for cetaceans; 206 dB re 1 μPa^{2}•s for California sea lions, Steller sea lions, and Northern fur seals; and 204 dB re 1 μPa^{2}•s for Northern elephant seals. DEIS at 3.8-90. It bases its cetacean threshold primarily on a synthesis of studies on two species of cetaceans, bottlenose dolphins and beluga whales, conducted by the Navy's SPAWAR laboratory in San Diego and, to a lesser extent, by researchers at the University of Hawaii. DEIS at 3.8-85 to 86.

Notably, the Navy's extrapolation of data from bottlenose dolphins and belugas to all cetaceans is not justifiable. Given the close association between acoustic sensitivity and threshold shift, such an approach must presume that belugas and bottlenose dolphins have the best hearing sensitivity in the mid-frequencies of any cetacean. However, harbor porpoises and killer whales are more sensitive over part of the mid-frequency range than are the two species in the SPAWAR and Hawaii studies.[87] Furthermore, the animals in the studies may not represent the full range of variation even within their own species, particularly given their age and situation: the SPAWAR animals, for example, have been housed for years in a noisy bay.[88]

3. "Risk Function" for Behavioral Effects

There are many glaring problems with the Navy's adoption of an acoustic risk function to estimate the probability of behavioral effects. Dr. Bain sets forth a detailed critique, which is attached to this letter. Several problems are discussed below.

In contrast to the Navy's 2005 DEIS for the Undersea Warfare Training Range (which established a threshold of 190 dB re 1 μPa^{2}•s) and the threshold which NMFS insisted the Navy adopt during RIMPAC 2006 and subsequent exercises off California and Hawaii (173 dB re 1 μPa^{2}•s), here the Navy redefines its position by applying a dose-response risk function to measure behavioral effects that begins at 120 dB re 1 µPa and reaches its mean at 165 dB re 1 µPa. DEIS at 3.8-98 to 101. Agencies are not entitled to substantial deference under the Administrative Procedure Act when they reverse previously held positions. Some of the more significant problems with the Navy's new

[87] Richardson et al., Marine Mammals and Noise at 209.

[88] M.L.H. Cook, Behavioral and Auditory Evoked Potential (AEP) Hearing Measurements in Odontocete Cetaceans (2006) (Ph.D. thesis).

position include misusing SPAWAR and Haro Strait data, as well as failing to include data from the Hanalei Bay incident.

Once again, the Navy relies on studies of temporary threshold shift in captive animals for its primary source of data. DEIS 3.8-95 to 98. Marine mammal scientists have long recognized the deficiencies of using captive subjects in behavioral experiments, and to blindly rely on this material, to the exclusion of copious data on animals in the wild, is not supportable by any standard of scientific inquiry. Cf. 40 C.F.R. § 1502.22. The problem is exacerbated further by the fact that the subjects in question, roughly two belugas and five bottlenose dolphins, are highly trained animals that have been working in the Navy's research program in the SPAWAR complex for years.[89] Indeed, the disruptions observed by Navy scientists, which included pronounced, aggressive behavior ("attacking" the source) and avoidance of feeding areas associated with the exposure, occurred during a research protocol that the animals had been rigorously trained to complete.[90] The SPAWAR studies have several other major deficiencies that NMFS, among others, has repeatedly pointed out. In relying so heavily on them, the Navy has once again ignored the comments of numerous marine mammal behaviorists on the Navy's USWTR DEIS, which sharply criticized the Navy for putting any serious stock in them.[91]

In addition, the Navy appears to have misused data garnered from the Haro Strait incident—one of only three data sets it considers—by including only those levels of sound received by the "J" pod of killer whales when the USS *Shoup* was at its closest approach. DEIS at 3.8-96 to 97. These numbers represent the maximum level at which the pod was harassed; in fact, the whales were reported to have broken off their foraging and to have engaged in significant avoidance behavior at far greater distances from the ship, where received levels would have been orders of magnitude lower.[92] Not surprisingly, then, the Navy's results are inconsistent with other studies of the effects of various noise sources, including mid-frequency sonar, on killer whales. We must insist that the Navy provide the public with its propagation analysis for the Haro Strait event.

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[89] See, e.g., S.H. Ridgway, D.A. Carder, R.R. Smith, T. Kamolnick, C.E. Schlundt, and W.R. Elsberry, Behavioral Responses and Temporary Shift in Masked Hearing Threshold of Bottlenose Dolphins, *Tursiops truncatus*, to 1-Second Tones of 141 to 201 dB re 1 µPa (1997) (SPAWAR Tech. Rep. 1751, Rev. 1).

[90] C.E. Schlundt, J.J. Finneran, D.A. Carder, and S.H. Ridgway, Temporary Shift in Masked Hearing Thresholds of Bottlenose Dolphins, Tursiops truncatus, and White Whales, Delphinapterus leucas, after Exposure to Intense Tones, 107 Journal of the Acoustical Society of America 3496, 3504 (2000).

[91] See comments from M. Johnson, D. Mann, D. Nowacek, N. Soto, P. Tyack, P. Madsen, M. Wahlberg, and B. Møhl, received by the Navy on the Undersea Warfare Training Range DEIS. These comments are hereby incorporated into this letter. See also Letter from Rodney F. Weiher, NOAA, to Keith Jenkins, Naval Facilities Engineering Command Atlantic (Jan. 30, 2006); Memo, A.R. document 51, NRDC v. Winter, CV 06-4131 FMC (JCx) (undated NOAA memorandum).

[92] See,. e.g., NMFS, Assessment of Acoustic Exposures on Marine Mammals in Conjunction with *USS Shoup* Active Sonar Transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington—5 May 2003 at 4-6 (2005).

The Navy also fails to include data from the July 2004 Hanalei Bay event, in which 150-200 melon-headed whales were embayed for more than 24 hours during the Navy's Rim of the Pacific exercise. According to the Navy's analysis, predicted mean received levels (from mid-frequency sonar) inside and at the mouth of Hanalei Bay ranged from 137.9 dB to 149.2 dB.[93] The Navy has from the beginning denied any connection between its major international exercise and the mass stranding. However, the Navy's specious reasoning is at odds with the stranding behavior observed during the event and with NMFS' report on the matter, which ruled out every other known potential factor and concluded that sonar was the "plausible if not likely" cause.[94] The Navy's failure to incorporate these numbers into its methodology as another data set is unjustifiable.

Furthermore, the risk function should have taken into account the social ecology of some marine mammal species. For species that travel in tight-knit groups, an effect on certain individuals can adversely influence the behavior of the whole. (Pilot whales, for example, are prone to mass strand for precisely this reason; the plight of the 200 melon-headed whales in Hanalei Bay, and of the "J" pod of killer whales in Haro Strait, and the most recent stranding of melon-headed whales in the Philippines may be pertinent examples.) Should those individuals fall on the more sensitive end of the spectrum, the entire group or pod can suffer significant harm at levels below what the Navy would take as the mean. In developing its "K" parameter, the Navy must take account of such potential indirect effects. 40 C.F.R. § 1502.16(b).

We must also note that the Navy's exclusive reliance on sound pressure levels ("SPLs") in setting a behavioral threshold is misplaced. The discussion in the DEIS speaks repeatedly of uncertainty in defining the risk function and recapitulates, in its summary of the earlier methodology, the benefits implicit in the use of a criterion that takes duration into account. It is therefore appropriate for the Navy to set dual thresholds for behavioral effects, one based on SPLs and one based on energy flux density levels ("ELs").

Finally, the Navy's threshold is applied in such a way as to preclude any assessment of long-term behavioral impacts on marine mammals. It does not account, to any degree, for the problem of repetition: the way that apparently insignificant impacts, such as subtle changes in dive times or vocalization patterns, can become significant if experienced repeatedly or over time.[95]

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[93] Navy, 2006 Supplement to the 2002 Rim of the Pacific (RIMPAC) Programmatic Environmental Assessment D-1 to D-2 (May 2006).

[94] B.L. Southall, R. Braun, F.M.D. Gulland, A.D. Heard, R.W. Baird, S.M. Wilkin, and T.K. Rowles, Hawaiian Melon-Headed Whale *(Peponacephala electra)* Mass Stranding Event of July 3-4, 2004 (2006) (NOAA Tech. Memo. NMFS-OPR-31); See also R.L. Brownell, Jr., K Ralls, S. Baumann-Pickering and M.M. Poole, Behavior of melon-headed whales, *Pepnoncephalia electra*, near oceanic islands, Marine Mammal Science, (publication pending 2009).

[95] The importance of this problem for marine mammal conservation is reflected in a recent NRC report, which calls for models that, inter alia, translate such subtle changes into disruptions in key activities like feeding and breeding that are significant for individual animals. National Research

In sum, the Navy has established thresholds and a risk function that are fundamentally inconsistent with the scientific literature on acoustic impacts and with marine mammal science in general. Indeed, using these thresholds to support a final EIS would violate NEPA.

Modeling of Acoustic Impacts

The Navy bases its calculation of marine mammal impacts on a series of models that determine received levels of sound within a limited distance of a sonar array and then estimate the number of animals that would therefore suffer injury or disruption. It is difficult to fully gauge the accuracy and rigor of these models with the limited information that the DEIS provides; but even from the description presented here, it is clear that they are deeply flawed. Among the non-conservative assumptions that are implicit in the model:

(1) As discussed above, the thresholds established for injury and behavioral effects are inconsistent with the available data and are based, in part, on assumptions not acceptable within the field;

(2) The Navy does not properly account for reasonably foreseeable reverberation effects (as in the Haro Strait stranding incident),[96] giving no indication that its modeling sufficiently represents areas in which the risk of reverberation is greatest;

(3) The model fails to consider the possible synergistic effects of using multiple sources, such as ship-based sonars, in the same exercise, which can significantly alter the sound field. It also fails to consider the combined effects of multiple exercises, which, as NMFS indicates, may have played a role in the 2004 Hanalei Bay strandings;[97]

(4) In assuming animals are evenly distributed, the model fails to consider the magnifying effects of social structure, whereby impacts on a single animal within a pod, herd, or other unit may affect the entire group;[98] and

(5) The model, in assuming that every whale encountered during subsequent exercises is essentially a new whale, does not address cumulative impacts on the breeding, feeding, and other activities of species and stocks.

Council. Marine Mammal Populations and Ocean Noise: Determining When Noise Causes Biologically Significant Effects 35-68 (2005).

[96] NMFS, Assessment of Acoustic Exposures on Marine Mammals in Conjunction with *USS Shoup* Active Sonar Transmissions in the Eastern Strait of Juan de Fuca and Haro Strait, Washington, 5 May 2003 (2005).

[97] Southall et al., Hawaii Melon-Headed Whale at 31, 45.

[98] The effects of this deficiency are substantially increased by the Navy's use of a risk function, rather than an absolute threshold, to estimate Level B harassment.

Before issuing a final EIS, the Navy must revise its flawed modeling systems and make them available to the public.

CRITIQUE OF THE RISK ASSESSMENT MODEL EMPLOYED TO CALCULATE TAKES IN THE HAWAII RANGE COMPLEX SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

David E. Bain, Ph.D.

Abstract

Rather than using a fixed received level threshold for whether a take is likely to occur from exposure to mid-frequency sonar, the Navy proposed a method for incorporating individual variation. Risk is predicted as a function of three parameters: 1) a basement value below which takes are unlikely to occur; 2) the level at which 50% of individuals would be taken; and 3) a sharpness parameter intended to reflect the range of individual variation. This paper reviews whether the parameters employed are based on the best available science, the implications of uncertainty in the values, and biases and limitations in the model. Data were incorrectly interpreted when calculating parameter values, resulting in a model that underestimates takes. Errors included failure to recognize the difference between the mathematical basement plugged into the model, and the biological basement value, where the likelihood of observed and predicted takes becomes non-negligible; using the level where the probability of take was near 100% for the level where the probability of take was 50%; and extrapolating values derived from laboratory experiments that were conducted on trained animals to wild animals without regard for the implications of training; and ignoring other available data, resulting in a further underestimation of takes. In addition, uncertainty, whether due to inter-specific variation or parameter values based on data with broad confidence intervals, results in the model being biased to underestimate takes. The model also has limitations. For example, it does not take into account social factors, and this is likely to result in the model underestimating takes. This analysis has important management implications. First, not only do takes occur at far greater distances than predicted by the Navy's risk model, the fact that larger areas are exposed to a given received level with increasing distance from the source further multiplies the number of takes. This implies takes of specific individuals will be of greater duration and be repeated more often, resulting in unexpectedly large cumulative effects. Second, corrections need to be made for bias, and corrections will need to be larger for species for which there are no data than for species for which there are poor data. Third, the greater range at which takes would occur requires more careful consideration of habitat-specific risks and fundamentally different approaches to mitigation. The value of the model is that it provides a focus for future research on the effects of noise on marine mammals. In particular, the sensitivity analysis indicates the primary need for data is determining response probabilities of a wide range of species when exposed to received levels near the level at which 50% of individuals respond.

Introduction

The Navy distinguishes two types of takes: Level A, in which there is immediate injury or death; and Level B, in which there is no immediate injury, but cumulative exposure may lead to harm at the population level. However, in certain contexts, Level B harassment may lead to Level A takes through indirect mechanisms.

The population effects of Level A takes on populations are relatively easy to assess, as individuals that are killed are obviously removed from the population, and those that are injured are more likely to die whenever the population is next exposed to stress.

Calculating the population effects of Level B takes is a topic of contemporary research (Trites and Bain 2000). For example, Bain (2002a) explored using energetic consequences of behavior change in conjunction with population dynamics models to estimate population effects of Level B takes. Stress concurrent with Level B harassment would have additional population consequences. Stress may occur in the absence of behavioral change, or the absence of change in significant behavioral patterns such as foraging or nursing, or exclusion from optimal habitat. Lusseau et al. (2006) concluded disturbance caused a decline in and posed a significant threat to the survival of the bottlenose dolphin population in Doubtful Sound, New Zealand. While they noted vessel strikes were occurring (Level A takes), cumulative behavioral effects (Level B takes) were believed to be the primary threat to the population.

Models relating acoustic exposure to takes thus are not sufficient by themselves to interpret the effects of noise on populations. It is likely that different magnitudes of effect, whether physical harm, behavioral change that leads to physical harm, disruption of significant behavioral activities, or behavioral changes that pose negligible risk to populations when they occur only rarely but can become significant when exposure is prolonged or repeated, will have different relationships to noise. The different magnitudes of takes will have different population consequences. Thus it will be challenging to synthesize results of multiple studies, as different measured endpoints may belong on different curves relating them to noise, and different endpoints will have different population consequences. Further, the population consequences can depend on the health of the population (Bain 2002a). All these factors need to be considered when evaluating the environmental consequences of exposing marine mammals to noise.

Unconditional effects

Temporary Threshold Shifts in captive marine mammals are commonly used as an index of physical harm (e.g., Nachtigall et al. 2003, Finneran et al. 2002 and 2005, Kastak et al. 2005). Limiting experimental noise exposure to levels that cause temporary effects alleviates ethical concerns about deliberately causing permanent injury. However, repeated exposure to noise that causes temporary threshold shifts can lead to permanent hearing loss. In fact, chronic exposure to levels of noise too low to cause temporary threshold shifts can cause permanent hearing loss. Animal models (e.g., rats, cats,

monkeys, chinchillas) have been used for tests of noise causing permanent physical harm (Henderson et al. 1991, Gao et al. 1992, Blakeslee et al. 1978, Clark 1991). Damage to hearing from noise exposure is an example of unconditional injury from noise. OSHA (2007) requires limiting human exposure to noise at 115 dB above threshold (equivalent to 145 dB re 1 μPa for killer whales, Szymanski et al. 1999) to 15 minutes.

Stress reactions are another available index (e.g., Romano et al. 2004). Ayres (personal communication) found evidence suggesting that whale watching results in increased levels of stress hormones in wild killer whales.

Conditional effects

Changes in behavior resulting from noise exposure could result in indirect injury in the wild. A variety of mechanisms for Level B harassment to potentially lead to Level A takes have been identified.

Gas bubble lesions have been observed in beaked whales (Jepson et al. 2003, Fernandez et al. 2005, Cox et al. 2006). A variety of mechanisms have been proposed for this. While some have proposed these may be due to acoustically mediated bubble growth, and hence are an unconditional consequence of noise exposure (Crum and Mao 1996), it is more likely that these result from decompression sickness. That is, changes in dive behavior may prevent clearance of nitrogen gas from the body, resulting in larger bubbles than would occur in undisturbed dive patterns. One possible change is that beaked whales may remain submerged for an unusually long period of time, and then rapidly ascend. The rapid ascent is a change in behavior that prevents nitrogen from remaining in solution in the blood. Zimmer and Tyack (2007) questioned whether the rapid ascent mechanism would actually result in lesions, and proposed another behavior change that might occur is interruption of deep dives. Deep dives allow the lungs to collapse, preventing nitrogen from reaching the body. Further, a series of rapid breaths at the surface can be used to clear nitrogen absorbed under pressure. Interruption of the normal surface interval can allow nitrogen to build up over time. Changes in depths of dives are of more concern than rapid ascents as this mechanism would be applicable to a wide range of species, while if the rapid ascent mechanism is involved, it would be primarily a concern for deep diving species (Zimmer and Tyack 2007).

While failure to flee may lead to injury in beaked whales, flight may lead to injury in other species. Minke whales have been found stranded after sonar exercises (NOAA and Navy 2001). A minke whale was observed traveling at high speed during exposure to mid-frequency sonar in Haro Strait in 2003. It is easy to see how such behavior would lead to stranding when a beach is located in front of the whale, as minke whales lack echolocation and visibility is limited underwater. Exhaustion from rapid flight leading to heart or other muscle damage (Williams and Thorne 1996) could also account for increased mortality such as was observed in harbor porpoises following sonar exercises in Juan de Fuca and Haro Straits in April and May of 2003. Harbor porpoises, in contrast to

Dall's porpoises, rarely engage in sustained high energy activities such as rapid swimming or bow riding, and hence are less adapted to long distance flight responses.

Even successful flight may have negative survival consequences. In the absence of disturbance, individuals will tend to occupy optimal habitat. Displacement from optimal habitat will have consequences that will depend on the duration of the displacement, the quality of the alternate habitat, and the condition of the individuals at the time of displacement.

Separation of individuals from social units is another consequence of noise exposure that may lead to mortality. In 2003 in Haro Strait, some killer whales responded to mid-frequency sonar by seeking shelter behind a reef. Others chose to flee, resulting in splitting of a pod that historically spent all of its time together as a single unit. While no deaths resulted from this particular incident, other killer whales have been observed separated from their social units resulting in death prior to reunion or requiring human intervention to restore the individual to its social unit (Schroeder et al. 2007).

Temporary threshold shifts may conditionally lead to harm. Impaired hearing ability increases vulnerability to ship strike. In 2003, blunt force trauma was identified as a cause of death in the investigation of harbor porpoise mortalities following exposure to mid-frequency sonar in Washington State. A minke whale was nearly struck by a research vessel in the area where one had been observed fleeing mid-frequency sonar exposure. These species are familiar with boats in that area, and normally avoid them by a wide margin when they can hear them coming.

Impaired auditory ability may also increase predation risk. For example, Dahlheim and Towell (1994) reported an attack by killer whales on white-sided dolphins. The approach by the whales went undetected due to the noise of the research vessel. Further, impaired hearing may impair foraging ability and communication (Bain and Dahlheim 1994).

The Risk Function Model

The risk function uses three parameters. B is the received level at which the most sensitive individuals start to respond with changes in significant behaviors such as foraging. K is the difference in received level between the level at which half of individuals respond and the level at which the most sensitive individuals respond. That is, B+K is the level at which 50% of individuals respond. A is a shape parameter that attempts to capture the variability in responsiveness of the population. That is, are essentially all the individuals the same and the bulk of them become responsive when the received level is near B+K, in which case a simple threshold model would provide a good approximation, or is there a lot of variation in the population, in which case many individuals become responsive when received levels are near B?

The model is based on the hypothesis that some individuals start to respond at lower levels than others. It anticipates that some individuals will hold out until very high levels

before responding. The model includes parameters that allow it to be applied appropriately to species with differing noise tolerance. However, the Navy used one set of parameter values to predict the responses of all species. This paper reviews the accuracy of the choice of parameter values, the implications of using the wrong parameter values, and whether the model makes unbiased predictions when uncertainty in the parameter values exists.

Limitations

Like many models, the risk model has limitations. It fails to take into account social interactions. For example, the model anticipates that individuals may move away from a source at different exposure levels, but fails to recognize that this would result in individuals becoming separated from the group. This is likely to lead to the curve becoming asymmetrical, with the "holdouts" responding to the behavior of their schoolmates rather than the sound. As the area exposed to lower levels of noise is larger than the area exposed to higher levels of noise, this would result in more individuals being affected than the model predicts for social species.

The model does not account for multiple sources. Kruse (1991), Williams and Ashe (2007) and Bain et al. (2006) noted that killer whale responses to vessels varied with the number of vessels present. The magnitude of certain responses increased on the order of 10% per source, although Williams and Ashe (2007) noted that large numbers of sources could result in changes in the opposite direction of small numbers of sources, potentially canceling out the effect. That is, rather than a risk function that simply identifies how likely a response is to occur, one that takes into account the magnitude of the response would be ideal.

Pingers have been used to reduce entanglement in gillnets. Kraus et al. (1997) were able to reduce entanglement of harbor porpoises by 90%. Gearin et al. (1996, 2000) used more pingers, and were able to reduce entanglement by 95%. While this could be accounted for by the fact that more pingers increase the minimum sound level at the net (Bain 2002b), Laake et al. (1997, 1998, 1999) found porpoises typically remained much farther from the net than the spacing between pingers, even after the avoidance response declined due to habituation. Thus, the effect of multiple sources seems larger than the effect of fewer sources. Pingers have also been successful in protecting other species from nets (Barlow and Cameron, 1999; Cameron 1999, Stone et al. 1997).

In addition to quantitative changes in response to multiple sources, there may be a qualitative change in the response. For example, noise is used in drive fisheries of many odontocete species to cause stranding or near strandings. That is, multiple sources were used to displace individuals in a particular direction, and the consequences (stranding) were more serious than displacement from the source alone as would result from exposure to a single source.

The risk to the population of qualitatively different responses varies not only with the type of response, but the circumstances. If the response is going ashore, fatalities are highly likely to result. If the response is slowly moving away for a short period of time, no fatalities are likely to result. However, if the response is to slowly move away from a prime feeding area for an extended period of time, and the population is food limited, fatalities may result, and the number is likely to be related directly to the duration of exclusion from the feeding area, and only indirectly to the cumulative sound energy received.

Finally, the model assumes that marine mammals behave independently from each other. This is not likely to be the case. Even species that are normally solitary, like harbor seals, have been observed to school in response to high energy noise (personal observation). To remain a member of a group, individuals must remain in geographic proximity to each other. As more sensitive individuals move away, others who are not sufficiently disturbed by the sound itself would need to move as well to remain members of the group. The result is likely to be a step function at moderate exposure levels rather than the gradual increase in risk predicted by the model. The result would be that risk is underestimated. The proportion of individuals necessary to lead all individuals to respond in a similar manner to noise is likely to vary among species, and propensity to mass strand may be a good predictor of the importance of this effect.

Datasets

The Navy chose to rely upon three datasets.

Captive cetaceans

Studies of captive marine mammals provide an excellent setting for identifying direct effects of sound. E.g., one of the datasets employed by the Navy consists of studies relating short-term exposure of bottlenose dolphins and belugas to high levels of noise to Temporary Threshold Shifts. The Navy (Dept. Navy 2008b, p 3-7) noted aggressive behavior toward the test apparatus, suggesting stress was another consequence of the test (see also Romano et al. 2004). Such effects would be unconditional results of noise exposure.

However, extrapolation of the level at which aggression was observed to the level at which behaviorally mediated effects might occur in the wild is problematic, as this depends on how well trained the subjects were. For example, the Navy has been a leader in training dolphins and other marine mammals to cooperate with husbandry procedures. Tasks like taking blood, stomach lavage, endoscopic examination, collection of feces, urine, milk, semen and skin samples, etc. once required removing individuals from the water and using several people to restrain them. With training, painful and uncomfortable procedures can be accomplished without restraint and with a reduction in stress that has significantly extended lifespans of captive marine mammals (Bain1988).

That is, the absence of avoidance or aggressive behavior does not imply an absence of physical harm, much less the absence of potential for behavior changes that may lead to indirect harm.

Physical harm may occur in the wild without avoidance responses as well. Yano and Dahlheim (1995) found killer whales continued to predate on longlines despite being physically injured by deterrents such as gunshots. Reeves et al. (1996) reviewed other examples from fishery interactions of injurious approaches to deterrence failing.

If belugas and bottlenose dolphins are like killer whales, and the 50% risk level is about 15 dB below the 50% risk level for behavioral change in trained animals (see below), this would put their value around 170 dB re 1 µPa. Even this is likely to be an overestimate, as boat motors with a source level of 165 dB re 1 µPa can cause behavioral changes in bottlenose dolphins (Nowacek et al. 2001.) This new value, 170 dB re 1 µPa, averaged with the other Navy datasets, would drop the average 50% risk level to 160 dB re 1 µPa.

Killer whales

The second dataset is killer whales exposed to mid-frequency sonar from the USS Shoup in Haro Strait, Washington, in May, 2003. The level quoted in the HRC SDEIS (Dept. Navy 2008b) is an estimate of the received levels experienced when mid-frequency sonar was transmitted from about 3 km away. This level caused major behavioral changes in 100% of exposed whales (Risk=1 for Level B takes of a magnitude that in other contexts or species could lead indirectly to physical harm), but was not to believed to have caused Level A takes (the whales did not strand, and received levels were estimated to be too low to have caused threshold shifts, NMFS OPR 2005) in any individuals (Risk = 0). However, much more data are available from the May, 2003 Shoup incident. Behavioral changes were first observed at 47 km (where the received level was estimated to be 121 dB). The behavioral response was tail slapping by about 25% of the individuals observed, which is consistent with observed responses to vessel noise at a similar level. At a distance greater than 22 km, the direction of travel changed away from a feeding area, and hence foraging behavior was disrupted. At this distance, the received level may have increased to the neighborhood of 135 dB re 1 µPa with about 6 dB of reduced spreading loss and 6 dB reduced absorption. This would be comparable to a vessel traveling at low speed approaching to within 10 m, which is very difficult to accomplish without causing whales to turn away. 100% of killer whales responded by abandoning their feeding ground and moving away from the noise source at this received level. While vessels cause diversion from straight-line paths, they have not been observed to displace killer whales from feeding areas (vessels have been observed to displace killer whales from resting areas, but this is likely mediated by presence rather than noise, as the effect is observed in the presence of silent vessels, Trites et al. 1995). Thus it is not surprising that a qualitatively different behavioral response was exhibited. The peak exposure level was estimated to be 175 dB re 1 µPa (HRC SDEIS, although NMFS noted that estimated levels tended to overestimate measured levels by 1-10 dB [NMFS OPR 2005], so the peak exposure level may have been only 165 dB). In addition to changing

travel patterns, the pod split, with approximately 50% of the pod continuing to shelter in an acoustic shadow zone, and the other 50% fleeing at high speed. Such behavior has not been observed in the presence of vessels alone. It should be emphasized that 100% of killer whales exhibited a disruption of a significant life process, foraging, at a level that may have been less than 135 dB re 1 µPa, in contrast to the value used in the SDEIS, 169.3 dB re 1 µPa for a 50% response.

Additional datasets are available for killer whale responses to noise. E.g., in Bain and Dahlheim's (1994) study of captive killer whales exposed to band-limited white noise in a band similar to that of mid-frequency sonar at a received level of 135 dB re 1 µPa, abnormal behavior was observed in 50% of the individuals. This is far lower than the level observed in bottlenose dolphins. In addition, Bain (1995) observed that 100% of wild killer whales appeared to avoid noise produced by banging on pipes (fundamental at 300 Hz with higher harmonics) to the 135 dB re 1 µPa contour. This indicates the difference between wild and captive killer whales (non-zero risk in captive marine mammals might correspond to 100% risk in wild individuals of the same species), as well as implying that risk of 100% may occur by 135 dB re 1 µPa for this genus in the wild.

Further, killer whales begin responding to vessel traffic at around 105-110 dB re 1 µPa with minor behavioral changes. By 135 dB re 1 µPa, disruption of foraging may approach 100%. Received level appears to be more important than proximity (Bain 2001). For risk to increase from near 0 at 105 dB re 1 µPa to near 100% by 135 dB re 1 µPa, with A=10, the 50% risk level would need to be about 120 dB re 1 µPa. Substituting 120 for 169 dB re 1 µPa reduces the average level for 50% risk by about 16 dB to 144 dB re 1 µPa. Substituting 135 dB re 1 µPa would reduce the average by 8 dB to 157 dB re 1 µPa.

Finally, the Navy's characterization of the killer whale dataset is incorrect. They indicate the effects observed in the presence of mid-frequency sonar in Haro Strait were confounded by the presence of vessels. However, the effects of vessels on killer whales have been extensively studied (e.g., Kruse 1991, Williams et al. 2002ab, Bain et al. 2006). Behavioral responses attributed to mid-frequency sonar are qualitatively different than those observed to vessels alone. While the observations are anecdotal, they were not inconsistent. The sonar signal was blocked from reaching the whales with full intensity by shallow banks or land masses during three segments of the observation period. The "inconsistencies" can be attributed to differences in behavior depending on whether there was a direct sound path from the Shoup to the whales. It should be noted there was extensive study of this population prior to exposure (see Bigg et al. 1990 and Olesiuk et al. 1990 for a description of typical research protocols), as well as extensive post-exposure monitoring (e.g., Bain et al. 2006).

Right whales

Similarly, the right whale data relied upon are of limited value. While they clearly illustrate that the value at which 50% of animals are influenced is below 135 dB re 1 µPa

and are therefore helpful in determining the upper limits of the B+K value, they lack sufficient low level exposures needed to fit the low end of the curve. As with killer whales, the Navy misused the data. They averaged values which resulted in 100% response. Thus the average value exceeds the level resulting in a 50% risk.

Right whales exposed to alerting devices consistently responded when received levels were above 135 dB re 1 μPa. Due to the small sample size (six individuals), it is unclear whether this is close to the 50% risk, the 100% risk level, or both. These data do not allow identification of B, as lower exposure levels were not tested. In mysticetes exposed to a variety of sounds associated with the oil industry, typically 50% exhibited responses at 120 dB re 1 μPa. Thus right whales may be similar to killer whales.

The consequences of using incorrect values can be seen by comparing the observed results of the right whale exposures to alert signals (Nowacek et al. 2004) with those predicted by the Navy model. Using the values of B=120, K=45, and A=10 in the HRC SDEIS (Dept. Navy 2008b), the probability of responses for the exposed whales are shown in column two of Table 1. The formula underestimated the number of takes by a factor of over 500. The Navy proposed using A=8 for mysticetes in recognition of this, and the results are shown in column 3. While improved, the model still underestimated takes by a factor of 183. One could try B=105 and K=15. Using A=10 provides a reasonable approximation, overestimating takes by 20% (column 4). A better approximation is provided by A=2, which predicts the number of takes within 2% (column 5). While the probability of all four right whales exposed to the highest alert signals responding is much less than one in a billion based on the Navy model and allows one to unequivocally reject the Navy's choice of parameter values as applying to that species, numerous other combinations of parameter values would fit the data as well as the values shown in the table here. Substituting 120 dB re 1 μPa for 139 dB re 1 μPa results in an average 6 dB lower at 159 dB re 1 μPa.

Table 1. Risk for right whales (model vs. observed)

Received Level (dB re 1 µPa)	RISK B=120,K=45,A=10	RISK B=120,K=45,A=8	RISK B=105,K=15,A=10	RISK B=105,K=15,A=2
Responded				
148	0.008647	0.022021	0.999973	0.891548
143	0.001217	0.004641	0.999908	0.86521
137	5.92E-05	0.000415	0.999488	0.819864
135	1.7E-05	0.000153	0.999026	0.800039
133	4.06E-06	4.86E-05	0.998059	0.777052
No Response				
134	8.52E-06	8.79E-05	0.998633	0.788974
Error Factor	502	183	0.83	1.01

Datasets not considered

The Navy incorrectly concludes that additional datasets are unavailable. In addition to the other killer whale datasets mentioned above, data illustrating the use of acoustic harassment and acoustic deterrent devices on harbor porpoises illustrate exclusion from foraging habitat (Laake et al. 1997, 1998 and 1999, Olesiuk et al. 2002). Data are also available showing exclusion of killer whales from foraging habitat (Morton and Symonds 2002), although additional analysis would be required to assess received levels involved. The devices which excluded both killer whales and harbor porpoises had a source level of 195 dB re 1 µPa, a fundamental frequency of 10 kHz, and were pulsed repeatedly for a period of about 2.5 seconds, followed by a period of silence of similar duration, before being repeated. Devices used only with harbor porpoises had a source level of 120-145 dB re 1 µPa, fundamental frequency of10 kHz, a duration on the order of 300 msec, and were repeated every few seconds. Harbor porpoises, which the Navy treats as having a B+K value of 120 dB re 1 µPa (with A large enough to yield a step function) in the AFAST DEIS (Dept.Navy 2008a), 45 dB lower than the average value used in the HRC SDEIS, may be representative of how the majority of cetacean species, which are shy around vessels and hence poorly known, would respond to mid-frequency sonar. Even if harbor porpoises were given equal weight with the three species used to calculate B+K, including them in the average would put the average value at 154 dB re 1 µPa instead of 165 dB re 1 µPa.

Harbor porpoise responses to various acoustic devices have been documented in captivity and the wild. Pingers with a source level of 130 dB re 1 µPa displace wild harbor porpoises to a distance of at least 100-1000 m, where the received level was likely in the

neighborhood of 80-90 dB re 1 µPa. Studies of harbor porpoises in captivity also found responses to acoustic deterrent devices, but could not be tested at such distances due to limitations in facility size (Kastelein et al. 1997, 2001). This is another example of how studies with captive cetaceans can produce misleading results. Airmar devices with a source level of 195 dB re 1 µPa displaced an estimated 95% of harbor porpoises to a distance of 3 km. While received levels were not measured, they could have been in the neighborhood of 120-130 dB re 1 µPa. These findings are well modeled with a B value of 70 dB re 1 µPa, a K value of 25, and an A value of 4.

Many species are poorly known, due in part to difficulties approaching them from boats and in part because they do not fare well in captivity. Species that may exhibit vulnerability to noise comparable harbor porpoises include many species of Stenella (e.g., striped dolphins), beaked whales, sperm whales (which are best studied from sailboats rather than motorized vessels, and show disruption of foraging at levels below 130 dB re 1 µPa, Jochens et al. 2006), and numerous poorly known species. In contrast, Dall's porpoises are known to bow ride, and appear far less easily disturbed by noise from airguns than harbor porpoises (Calambokidis et al. 1998). They may be an example of a relatively noise tolerant species like the bottlenose dolphins included in the SDEIS.

There are also data that are based on other noise sources. E.g., effects of vessel traffic on whale and dolphin behavior could be interpreted in terms of received levels. While engine noise tends to be continuous rather than intermittent like sonar, in a reverberant environment, mid-frequency sonar may be received as a nearly continuous sound (personal observation).

Likewise, records of marine mammal responses to broadband noise sources like airguns are also likely to be informative. While it may be difficult to extrapolate levels resulting in takes due to potential differences in perception of broadband and narrowband signals, and pulses rather than continuous sounds, they can give an idea of the range of intra-specific and inter-specific variation in B and K values and be applicable to determining the A parameter.

E.g., Calambokidis et al. (1998) found harbor seal responses to airguns typically consisted of visually orienting at received levels from 143 to 158 dB re 1 µPa and moving away at received levels from 158 dB to 185 dB re 1 µPa. However, one harbor seal oriented at 163 dB re 1 µPa rather than moving away. The highest measured received levels for Dall's porpoises were about 170 dB re 1 µPa, but only about 142 dB re 1 µPa for harbor porpoises. Similarly, the highest received levels measured for California sea lions were about 180 dB re 1 µPa, but only about 160 dB re 1 µPa for Steller sea lions. The highest measured received level was also 160 dB re 1 µPa for gray whales. That is, closely related species pairs may differ in their responsiveness to noise by over 20 dB, and taxonomically diverse species pairs may exhibit similar responsiveness.

TTS data similar to those available for cetaceans have been collected from harbor and elephant seals, and California and Steller sea lions (Kastak et al. 1999, 2005). As with cetaceans, field data suggest the Navy parameter values will underestimate takes of some

pinniped species, though they may provide a reasonable approximation for harbor seals and California sea lions (e.g., the data described above). Pinniped hearing in species studied to date is less sensitive than in cetaceans (e.g., California sea lions, Schusterman et al. 1972; Steller sea lions, Kastelein et al. 2005; harbor seals, Møhl 1968; northern fur seals, Moore et al. 1987; odontocetes, Au 1993), and it is commonly assumed they are less vulnerable to noise as a result. However, comparisons of Steller sea lions with Dall's porpoises and gray whales exposed to airgun noise indicates this is not always the case. A detailed consideration of pinnipeds is beyond the scope of this paper.

Using the datasets discussed above, 50% risk levels based on trained cetaceans may be 165 dB re 1 μPa, 120 dB re 1 μPa for killer and right whales, and 95 dB re 1 μPa for harbor porpoises. The average of 95, 120, 120 and 165 is 125 dB, 40 dB lower than the 50% risk value of 165 dB used in the Navy model. Even if one uses more stringent criteria for what constitutes takes (120 dB for harbor porpoises, 135 dB for killer and right whales, and 170 dB for bottlenose dolphins), the average would be 140 dB, which is 25 dB lower than the Navy model. Setting B to 100, K to 40, and A to 10 would result in roughly 40 times the number of takes than the model predicts using the Navy's parameter values.

Parameter values

The use of default values for model parameters is problematic. The available data are likely to be biased toward noise tolerant species. That is, species that are intolerant of noise are difficult to approach closely enough to study. They tend to fare poorly in captivity. E.g., spinner dolphins and harbor porpoises showed very poor survivorship in captivity, in contrast to bottlenose dolphins (Bain 1988). Thus averages based on available data are likely to underestimate effects on species for which data are not available.

While the Navy has proposed assuming noise tolerance is predictable along taxonomic lines, which correlate with hearing ability, empirical data do not support this assumption (Bain and Williams 2006). Likewise, there is interspecific variation in noise tolerance in fish (Kastelein 2008).

B Value

The basement value should be set low enough that the risk function predicts takes at the lowest of the level resulting in unconditional injuries, the level at which behaviorally mediated injuries are possible, and the level resulting in minor behavioral changes or stress that can have population level effects with sustained or repeated exposure.

An important property of the model is that the biologically observed basement value is different than the mathematical basement value. The Navy proposes using 120 dB re 1 μPa as the basement value. They indicate the selection of this value is because it was commonly found in noise exposure studies. However, 120 dB re 1 μPa has broadly been

found as the value at which 50% of individuals responded to noise, not a small percentage. Further, a mathematical B of 120 dB corresponds to a risk of less than 2% at 150 dB (with K=45 and A=10), which would be difficult to detect in empirical studies. That is, the studies should be re-evaluated to determine the level at which a small percentage of individuals responded, and then a further correction for the difference between mathematical B and the empirically determined biological B would be needed.

However, further consideration should be given to the nature of the responses used in those studies to determine whether they represent significant behavioral changes or are only likely to have a population scale effect with sustained or repeated exposure.

For example, many looked at changes in migration routes resulting from noise exposure, and found that 50% of migrating whales changed course to remain outside the 120 dB re 1 µPa contour (Malme et al. 1983, 1984). These results might be interpreted in several ways. They could be seen as minor changes in behavior resulting in a slight increase in energy expenditure. Under this interpretation, they would not qualify as changes in a significant behavior, and are irrelevant to setting the basement value. They could be interpreted as interfering with migration, even though the whales did not stop and turn around, and hence 120 dB would make an appropriate B+K value rather than B value. Third, the change in course could have been accompanied by a stress response, in which case the received level at which the course change was initiated rather than the highest level received (120 dB re 1 µPa) could be taken as the biological basement value.

As discussed above, sensitive species like harbor porpoises may be significantly affected by levels below 100 dB re 1 µPa (Kastelein et al. 1997, 2000, 2001). Foraging behavior of killer whales can be disrupted by levels on the order of 105-110 dB re 1 µPa or less (Williams et al. 2002ab, data in Bain et al. 2006). These are far below the 120 dB re 1 µPa level proposed, and as mentioned above, the mathematical B value needed to predict detectable changes at 110 dB would be far lower than 110 dB. For example, B=80, K=45, and A=10 predicts a risk of less than 2% at 110 dB.

K Value

The K value reflects the difference between the mathematical B value and the level at which 50% of individuals respond. Since determining the B value has problems of its own, this critique will focus on determining the B+K value. The 50% risk level is relatively easy to determine, and has been commonly reported in the literature, as noted in the SDEIS. However, the most common value was 120 dB re 1 µPa, as noted in the SDEIS, yet these studies were not used to calculate B+K. Instead, other datasets were used, and the numbers derived were not the 50% risk levels. As mentioned above, there are problems with extrapolation of responses in trained animals to wild animals, and the right and killer whale values were based on levels that resulted in nearly 100% risk, not 50% risk. (It may not be possible to determine a level at which 50% risk occurred in killer whales, but perhaps collaboration among killer whale researchers, whale watch operators, and the Navy might identify the B+K level for that event).

The 50% risk level is the median level at which individuals begin to respond, not the mean as calculated in the SDEIS. While there are data suggesting risk of threshold shift is related to duration of exposure, and hence the consequences of exposure to continuous noise sources would be different than exposure to intermittent sources, there are no such data for behaviorally mediated effects. Many species strongly avoid motorized vessels, and hence are more vulnerable to noise than the average of the species considered above. Such species are likely to include those in the sperm and beaked whale families, Pacific right whales, blue whales, melon-headed and pygmy killer whales, right whale dolphins, and Clymene, striped and rough-toothed dolphins. A smaller number of species, like Dall's porpoises, are more tolerant of noise sources than the average of the species considered above. Thus it is unlikely that the average value of B+K across cetacean species would be above 120 dB re 1 µPa, although the value would vary across species.

A value

While the A value is described as relating to the sharpness of the risk function, it also influences the symmetry of the function. As A increases, risk is redistributed from low noise levels to higher noise levels. The relative risk to the population, as opposed to risk to individuals, can be described as the risk to individuals at a given received level times the relative number of individuals receiving that level. As the sound spreads to larger areas, more individuals are exposed to lower levels of noise. The shape of the risk function and the spreading loss model determine the received level that poses the most risk to the population. At high received levels, the risk to the population may be small, because although the risk to individuals is high, the number of individuals likely to be exposed is small. At low levels, the risk to the population may be again small, because although the number of individuals exposed is high, the risk to those individuals is low. At intermediate values, the population experiences the most risk. When A is low, the risk to the population peaks near B, and at high A values, the risk is concentrated near B+K.

The choice of A value appears arbitrary. The Navy indicated they wanted to allow for more response at low levels, and adjusted the A value to accomplish this. However, this would have been better accomplished by lowering the B and B+K values as suggested above.

The significance of an A value underestimating the number of individuals responding to low levels of noise and overestimating the number of individuals responding to high levels of noise is that the area exposed to low levels of noise is larger than the area exposed to high levels of noise, so the calculation would lead to an underestimate of takes.

Calambokidis et al. (1998) employed an appropriate methodology for obtaining data for calculating A values of marine mammals exposed to airguns. They used a small vessel which moved toward and away from the seismic survey vessel, and hence were able to observe behavior and measure received values at distances of over 70 km as well as close

to the seismic survey vessel. Thus they were able to observe normal behavior in the presence of low levels of noise, as well as identify levels above which 100% of individuals exhibited behavioral change, and note inter-specific variation in response curves.

Interaction of Terms

It appears that B+K is a stronger predictor of the number of takes than either factor separately. As a result, similar risk curves can be generated for many different pairs of B and K as long as the sum is held constant. K and A together determine the range over which risk rises from 5% to 95%. Similarly, pairs of K and A over a range of values can generate similar risk curves.

With B=120, K=45, and A=10, the risk function predicts risk is near zero at received levels near 120, and that over 99.9% of takes will occur above 138 dB re 1 μPa. Even with A = 8, 99.9% of takes occur at levels above 135 dB. With A values this large, B is better described as the level at which the risk function is undefined (it requires dividing by 0) rather than the level at which risk becomes negligible. That is, the mathematical basement value and the biological basement value are different. The level at which data from marine mammals show barely detectable risk will be far above the mathematical basement value when K is 45 and A is 8 or 10. When K or A are small, the mathematical and biological B values become similar.

Another way of looking at the difference between the mathematical and biological basement value is to ask how much risk is detectable. In field studies, it will be difficult to distinguish responses that occur in only 5% of individuals from baseline behavior. Even if a study were sensitive enough to detect this, the received level to cause 5% risk is more than 30 dB above the mathematical B value for B=120, K =45 and A=8 or 10. That is, if risk becomes biologically detectable at 120 dB, the B value used in the equation for risk should be far lower. When the model uses the biological B value as the mathematical B value, it does not accurately predict the observed pattern of takes.

Long range effects

The Navy expressed uncertainty over whether there would be long distance effects, even when sound levels were received that are known to cause effects at close range. While I am not aware of observations at 65 nautical miles, responses at over 20 miles have been observed in killer whales to mid-frequency sonar, as well as at over 15 miles to mid-frequency sonar in Dall's porpoises, and harbor porpoises appeared to respond to airguns at over 40 nm (personal observation). The porpoises were responding at distances greater than they would respond to natural predators (killer whales), which are not believed to be detectable at those ranges.

Further evidence of long range responses to noise can be seen in differences in detection rates of some species using acoustic means and ship-based observations. Such studies indicate that species like Pacific right whales and blue whales avoid motorized vessels at distances which place them over the horizon (Wade et al. 2006, Širović 2006).

Uncertainty and Bias

To assess the effects of uncertainty in the parameter values (B, K, and A) on bias in the estimated number of takes, the following method was used. Two spreading loss models were used. A spherical spreading loss model was used, although this was likely to underestimate received levels, particularly at long distances. The other was spherical spreading at close range followed by a cylindrical spreading loss at longer distances model. An accurate model would depend on actual conditions, which would vary from one sonar exercise to another, both as bottom topography varies from place to place and the structure of the water column varies from time to time. The two models chosen should bracket actual conditions, and will serve for purposes of illustration at this stage. In both models, absorption at 3.5 kHz was used to correct for excess attenuation (Richardson et al. 1995). A source level of 235 dB re 1 µPa was assumed for purposes of illustration.

Individuals were assumed to be distributed uniformly with distance from the source, although in practice, action areas will be large enough that density could reasonably be expected to vary. The action area was divided into concentric rings 10 meters across. As the diameter of the ring increased, the area within the ring increased:

$$A = \pi r_o^2 - \pi r_i^2$$

where r_o is the outer diameter and r_i is the inner diameter of the ring.

The risk was calculated for individuals within the ring using the Navy equation, and the relative number of individuals experiencing that risk level was based on the area of the ring. As in the equation for the individuals, the cumulative impact on the population was normalized to 1 based on the Navy default parameters. The effects of uncertainty were observed by allowing the parameters to vary above and below the default values.

Using this model, the contributions of the innermost rings were small, due to their small area, and the contribution of the outermost rings were small, due to the low risk experienced by individuals in those ring. Figures 1-20 show the shape of the risk function and the relative numbers of takes that would occur as a function of received level for a variety of parameter value combinations.

Selected values of B, K and A were used to calculate relative effects, and the results are shown in Table 2 for a spherical spreading model, and Table 3 for a model that assumes spherical spreading for the first 2 km and then cylindrical spreading after that. The default values are shown in bold. Take numbers are based on Alternative 3 in the Hawaii

Range Complex SDEIS (Dept. Navy 2008b), which in turn is based on the No Action Alternative, Table 3.3.1-1. Where the number of takes approaches the size of the population, the actual number of takes will be smaller than shown in the table. However, individuals will be taken multiple times and the duration of takes will be longer than if the calculated number of takes were small. Presumably, longer and more frequent takes of individuals will have more impact on the population than takes due to single exposures.

Table 2. Sensitivity Analysis based on a spherical spreading model

B	K	A	Spreading Model	Relative Effect	Humpback takes	Striped Dolphin takes	Basis
80	45	10	Inv. Square	185.29	2,826,414	867,898	Vary B
90	45	10	Inv. square	75.25	1,147,864	352,471	Vary B
100	45	10	Inv. square	23.92	364,876	112,041	Vary B
110	45	10	Inv. square	5.68	86,643	26,605	Vary B
120	**45**	**10**	**Inv. square**	**1.00**	**15,254**	**4,684**	**SDEIS**
130	45	10	Inv. square	0.14	2,136	656	Vary B
140	45	10	Inv. square	0.02	305	94	Vary B
120	5	10	Inv. Square	167.18	2,550,164	783,071	Vary K
120	15	10	Inv. square	62.22	949,104	291,439	Vary K
120	25	10	Inv. square	18.33	279,606	85,858	Vary K
120	35	10	Inv. square	4.47	68,185	20,937	Vary K
120	**45**	**10**	**Inv. square**	**1.00**	**15,254**	**4,684**	**SDEIS**
120	55	10	Inv. square	0.23	3508	1077	Vary K
120	65	10	Inv. square	0.06	915	281	Vary K
120	75	10	Inv. square	0.01	153	47	Vary K
120	45	1	Inv. square	42.40	646,770	198,602	Vary A
120	45	5	Inv. square	3.27	49,881	15,317	Vary A
120	45	8	Inv. square	1.40	21,356	6,558	Vary A
120	**45**	**10**	**Inv. square**	**1.00**	**15,254**	**4,684**	**SDEIS**
120	45	12	Inv. Square	0.80	12,203	3,747	Vary A
120	45	20	Inv. Square	0.52	7,932	2,436	Vary A
120	45	100	Inv. Square	0.39	5,949	1,827	Vary A
120	**45**	**10**	**Inv. square**	**1.00**	**15,254**	**4,684**	**SDEIS**
105	15	10	Inv. square	251.39	3,834,703	1,177,511	*Orcinus*
105	15	8	Inv. square	250.96	3,828,144	1,175,497	
70	25	10	Inv. square	1070.25	16,325,594	5,013,051	*Phocoena*
70	25	8	Inv. square	1067.49	16,283,492	5,000,123	*Phocoena*

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Table 3. Sensitivity analysis based on a model with spherical spreading for 2 km followed by cylindrical spreading.

B	K	A	Spreading Model	Relative Effect	Humpback takes	Striped Dolphin takes	Basis
80	45	10	Hybrid	132.20	2,016,579	619,225	Vary B
90	45	10	Hybrid	65.31	996,239	305,912	Vary B
100	45	10	Hybrid	25.30	385,926	118,505	Vary B
110	45	10	Hybrid	6.67	101,744	31,242	Vary B
120	**45**	**10**	**Hybrid**	**1.00**	**15,254**	**4,684**	**SDEIS**
130	45	10	Hybrid	0.08	1,220	325	Vary B
140	45	10	Hybrid	.005	76	23	Vary B
120	5	10	Hybrid	127.23	1,940,771	595,947	Vary K
120	15	10	Hybrid	59.67	910,213	279,496	Vary K
120	25	10	Hybrid	21.39	326,238	100,177	Vary K
120	35	10	Hybrid	5.37	81,901	25,149	Vary K
120	**45**	**10**	**Hybrid**	**1.00**	**15,254**	**4,684**	**SDEIS**
120	55	10	Hybrid	0.18	2,724	836	Vary K
120	65	10	Hybrid	0.04	570	175	Vary K
120	75	10	Hybrid	0.01	143	44	Vary K
120	45	1	Hybrid	34.16	521,077	160,005	Vary A
120	45	5	Hybrid	3.65	55,665	17,093	Vary A
120	45	8	Hybrid	1.51	23,016	7,067	Vary A
120	**45**	**10**	**Hybrid**	**1.00**	**15,254**	**4,684**	**SDEIS**
120	45	12	Hybrid	0.73	11,103	3,409	Vary A
120	45	20	Hybrid	0.35	5,353	1,644	Vary A
120	45	100	Hybrid	0.17	2,593	796	Vary A
120	**45**	**10**	**Hybrid**	**1.00**	**15,254**	**4,684**	**SDEIS**
105	15	10	Hybrid	171.9	2,622,166	805,181	*Orcinus*
105	15	8	Hybrid	171.3	2,612,718	802,279	
70	25	10	Hybrid	516.41	7,877,318	2,418,864	*Phocoena*
70	25	8	Hybrid	514.46	7,847,573	2,409,731	*Phocoena*
80	45	10	Hybrid	132.20	2,016,579	619,225	"Average"species
100	40	10	Hybrid	40.88	623,525	191,464	Stringent criteria
120	45	10	Social75	1.004	15,315	4,703	75% step
120	45	10	Social50	1.06	16,169	4,965	50% step
120	45	10	Social25	1.49	22,728	6,979	25% step
120	45	10	Social10	3.02	46,067	14,146	10% step

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An interesting characteristic of the Navy model is that uncertainty causes it to be biased to underestimate risk. The reason for this bias is that the area receiving higher than the level of sound associated with a 50% risk based on default values is smaller than the area receiving lower levels. Thus if a species is 10 dB more sensitive than predicted (the B value), the cumulative risk is underestimated by a factor of 5.68, while if it is overestimated by 10 dB the correction is 0.14. Similarly, if the error is 20 dB, the correction factors are 23.92 and 0.02, respectively. However, the values average to 6.15, not 1 as would be the case if the default values provided an unbiased estimate. Errors in K show a similar pattern.

Likewise, if the default value of A is too low, it makes little difference in the estimated number of takes. However, if the default value of A is higher than the actual value, the effect on the population can be seriously underestimated when default values are used.

It should also be noted that the bias increases with increasing uncertainty.

Another source of uncertainty is propagation. As noted above, there is uncertainty over propagation that depends on the structure of the water column. Expectations can be based on historical measurements, and actual conditions can be measured to allow re-running propagation models with actual conditions. However, when received levels as a function of distance are higher than predicted, the result is asymmetrical relative to an error of the same magnitude in the opposite direction, as is the case for errors in the receiver parameters. E.g., when a sound channel forms, the area receiving enough noise to cause takes will dramatically increase.

Finally, the magnitude of the difference between parameter values based on reanalysis of the datasets used by the Navy (with harbor porpoises added, a species included in the AFAST Draft DEIS, Dept. Navy 2008a), and the Navy analysis should be emphasized. The number of takes predicted for an average species differs by a factor of more than 100. For humpbacks, this suggests individuals would be taken an average of about 250 times. Of course, when refresh times are taken into account, the number of retakes would be below this number, but the duration of takes would go up as a result. The cumulative effect on the population is likely to be far higher with the increased number and duration of takes predicted when more realistic parameters are used than when the Navy parameters are used.

SEL vs. SPL

Studies with captive marine mammals suggest that SEL provides a good predictor of Temporary Threshold Shift. That is, there is a tight relationship among signal strength, duration, and TTS. However, for behaviorally mediated effects, this relationship is likely to be different. SPL is likely to qualitatively determine the response for signals longer than 1 ms in duration. As long as signals are produced sufficiently often, the duration from the first signal to the last is likely to be more important than the SEL. That is, for

low received levels, one second signals produced every 40 seconds for 120 minutes are likely to have more impact than a continuous signal that lasts 10 minutes, even though the latter contains far more sound energy (600 seconds versus 180 seconds), as a behavioral response will be sustained for hours rather than minutes.

When attempting to predict effects of takes on the population, a take table with multiple columns should be developed. One based on SEL could be used to characterize direct effects such as threshold shifts. The next two should be based on SPL. The first of these should be analyzed to evaluate the total number of individuals that would change their behavior as a result of noise exposure, with particular attention paid to exposure in high risk areas (canyons, near shore, near shipping lanes) for potential indirect injuries. The third analysis would consider duration of exposure (in hours of exercise rather than in the SEL sense) to determine whether factors such as stress, displacement from preferred habitat, changes in foraging success and predation risk, etc., would result in cumulative effects that would alter population growth in a manner equivalent to lethal removals (Bain 2002a).

Summary

In summary, development of a function that recognizes individual variation is a step in the right direction. However, the selected equation is likely to produce underestimates of takes. This is due both to social factors increasing the likelihood of a response at low exposure levels, and asymmetries in the number of individuals affected when parameters are underestimated and overestimated due to uncertainty. Thus it will be important to use the risk function in a precautionary manner.

The sensitivity analysis reveals the importance of using as many datasets as possible. First, for historical reasons, there has been an emphasis on high energy noise sources and the species tolerant enough of noise to be observed near them. Exclusion of the rarer datasets demonstrating responses to low levels of noise biases the average parameter values, and hence underestimates effects on sensitive species. In particular, exclusion of the Navy's own interpretation of harbor porpoise data resulted in an increase of B+K by 11 dB, and a reduction in estimated takes by a factor of about 5. Second, uncertainty is correlated with bias. That is, even if a representative set of noise exposure-response data are used to calculate parameter values, the statistical uncertainty resulting from small samples results in biased parameter estimates that lead to underestimation of effects. Thus when estimating takes, it will be important to correct for bias. When estimating population effects on poorly known species, it will be important to be precautionary.

An important error in the selection of parameter values was in interpretation of existing data. Extrapolating behavioral changes in beluga and killer whales and bottlenose dolphins trained to tolerate physical harm that is in their long-term best interest to the threshold for onset of any physical harm in wild individuals is problematic. A similar mistake was made with the right whale data. The level at which 100% of individuals responded was used as the value at which 50% of individuals responded (B+K).

Likewise, the level at which 100% of killer whales responded to mid-frequency sonar is less than the value derived for B+K in the HRC SDEIS (Dept. Navy 2008b).

The "broad overview" of studies reported responses to received levels of 120 dB re 1 µPa by 50% of individuals. That is, 120 dB re 1 µPa should be taken as a "default" value for B+K, not B. Studies which looked at the level at which statistically significant changes were observed, rather than the level at which 50% of individuals responded found lower levels for B. As a result, B is overestimated, and B+K (the level at which risk is 50%) is as well. The use of data from trained dolphins and white whales biased the average B+K value upward. The exclusion of the effects of AHD's and ADD's on harbor porpoises further biases these values, though the sensitivity analysis suggests that using average values to extrapolate takes is unlikely to be accurate due to the broad range of inter-specific variation.

It is likely that biological B values should be in the range from just detectable above ambient noise to120 dB re 1 µPa. The resulting mathematical B value could be tens of dB lower, not the 120 dB re 1 µPa proposed. For many species, risk may approach 100% in the range from 120-135 dB re 1 µPa, putting K in the 15-45 dB range. A values do not seem well supported by data, and in any case, are likely to be misleading in social species as the risk function is likely to be asymmetrical with a disproportionate number of individuals responding at low noise levels. Re-evaluating the datasets identified by the Navy and including harbor porpoises, an average B+K value of 125 dB was found, and the over-representation of species that fare well in captivity likely biases the average above what it would be for all species. Rather than one equation fitting all species well, parameters are likely to be species typical. As realistic parameter values are lower than those employed in the HRC SDEIS (Dept. Navy 2008b), AFAST DEIS (Dept. Navy 2008a) and related DEIS's, take numbers should be recalculated to reflect the larger numbers of individuals likely to be taken. The difference between the parameter values estimated here and those used in the SDEIS suggests takes were underestimated by two orders of magnitude.

The large number of takes predicted when more sensitive species are used as sources of the parameters indicates that many individuals are likely to be taken many times, and the potential for population scale effects to result from small behavioral changes becomes significant.

Assuming spherical spreading out to 2 km followed by cylindrical spreading, B=120, K=45 and A=10 (the Navy values), most takes occur where the received level is greater than 157 dB re 1 µPa and the distance is less than 13 km. With stringent criteria for what constitutes a take derived in the reanalysis (B=120, K=20, A=10), most takes would occur where the received level is below 145 db re 1 µPa and the distance is over 43 km. With the average values calculated here (B=80, K=45, and assuming A=10), most takes would occur where the received level is below 135 dB re 1 µPa and the distance is over 80 km. These values predict over 100 times more takes as the Navy values, as well as the need for very different approaches to mitigation.

The Navy recognizes that the occurrence of conditional effects is important to assessing the impact of noise exposure. As such effects are the result of both received levels and environmental conditions, permit conditions will be important in determining these. The potential for conditional harm suggests using mitigation to limit the potential for actual harm. E.g., the risk of causing stranding can be minimized by restricting exercises to areas far from shore. Limiting the duration of exposure can limit the consequences of long-term displacement, risk of injury from prolonged flight, and limit cumulative effects. The risk of causing gas bubble lesions can be minimized by restricting use near canyons, for extended periods of time, and limiting the number of sources. The absolute effects can be minimized by conducting exercises in areas where population density is low, or at times of year when species of concern are absent.

Finally, it will be important to assess the cumulative effects of noise combined with other factors and population status (Wade and Angliss 1997) to assess the likely effects of sonar exercises on marine mammal populations.

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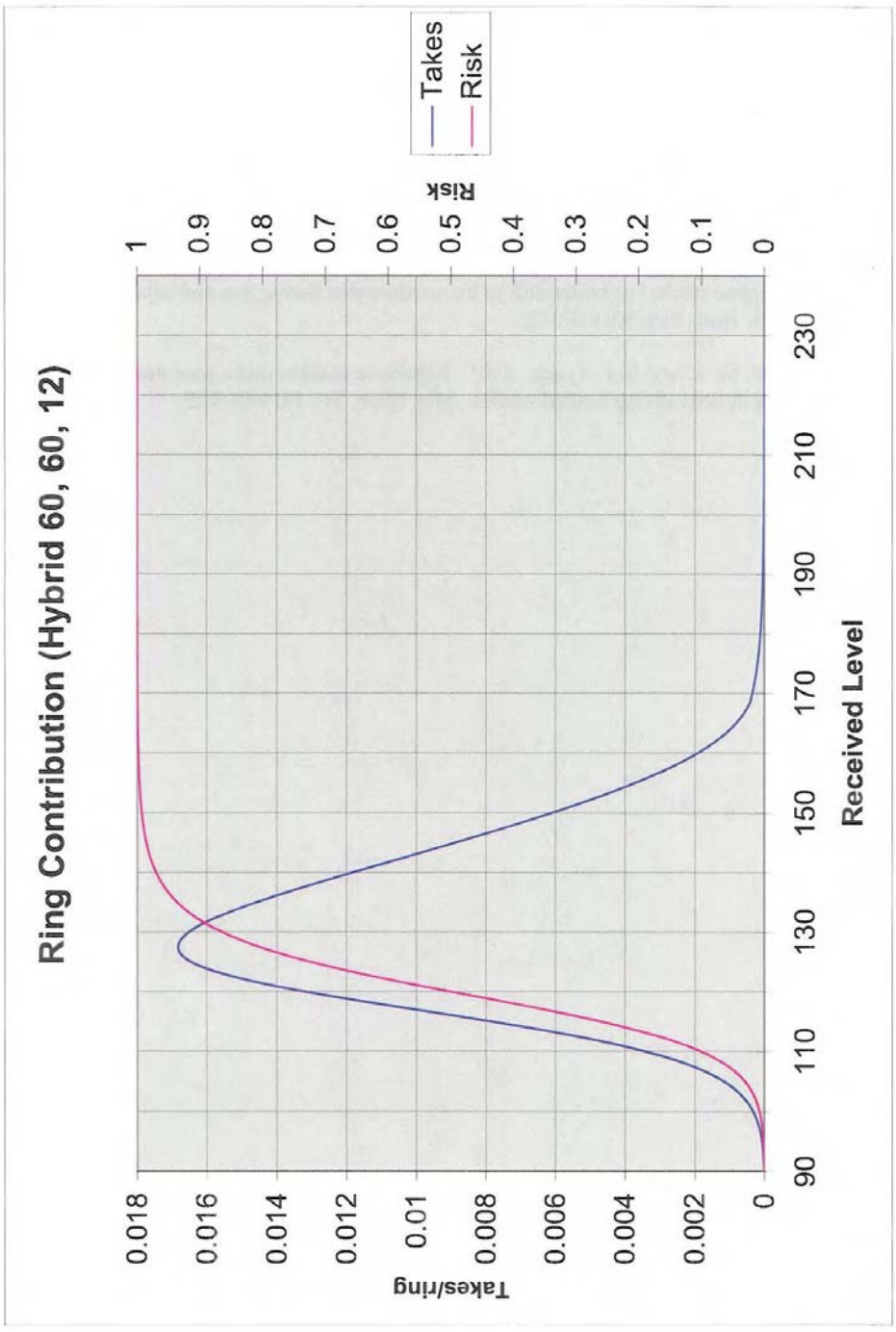
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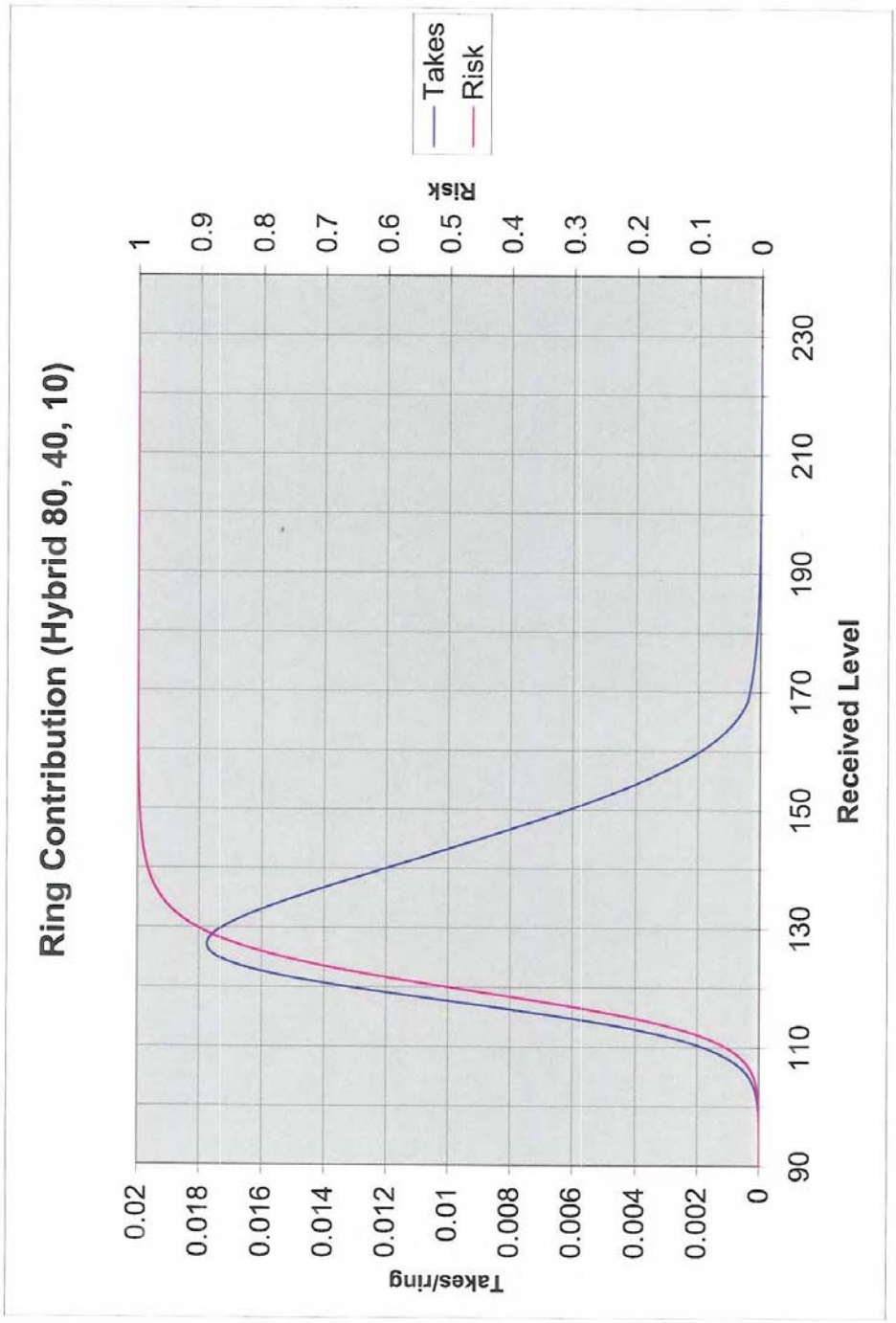
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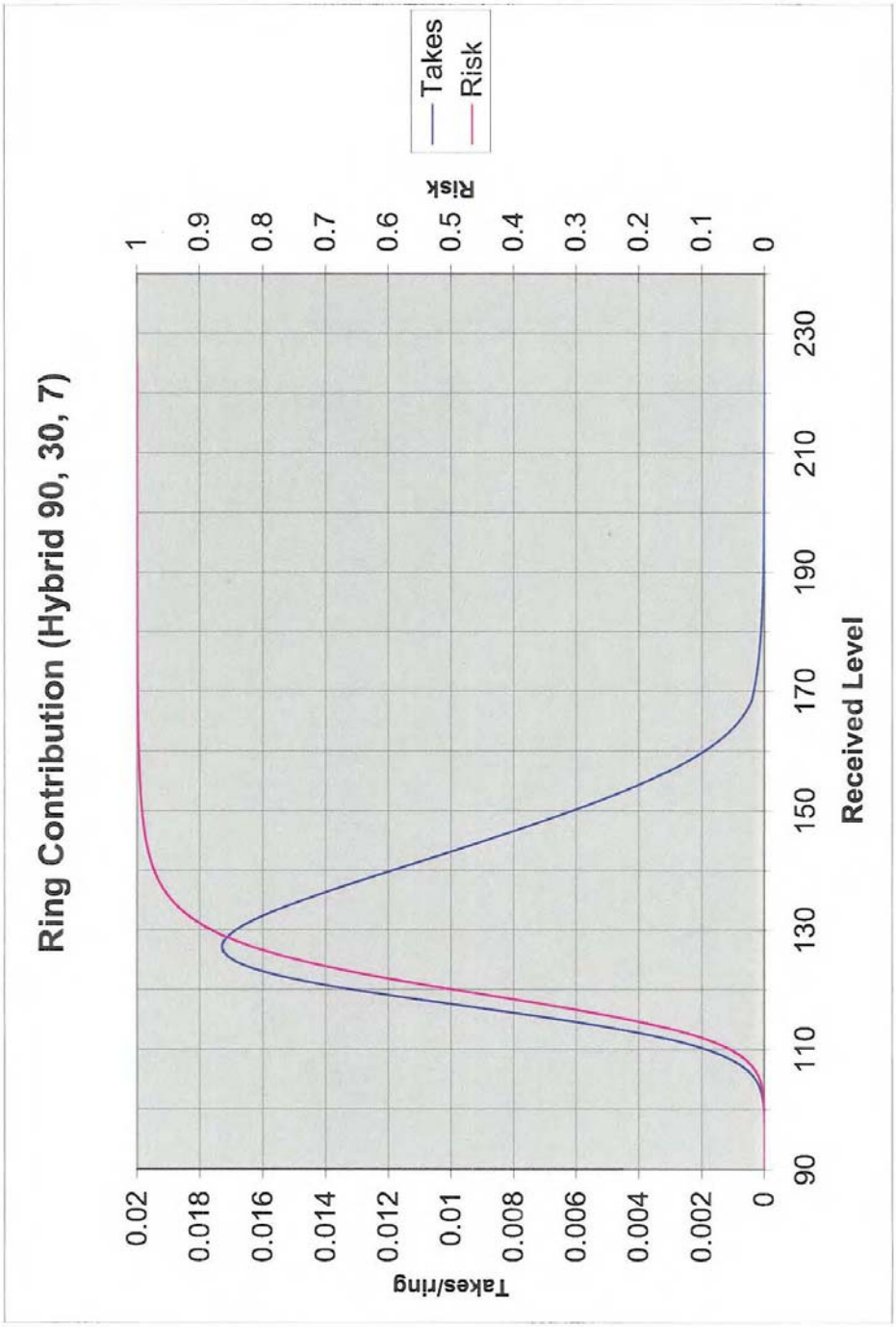
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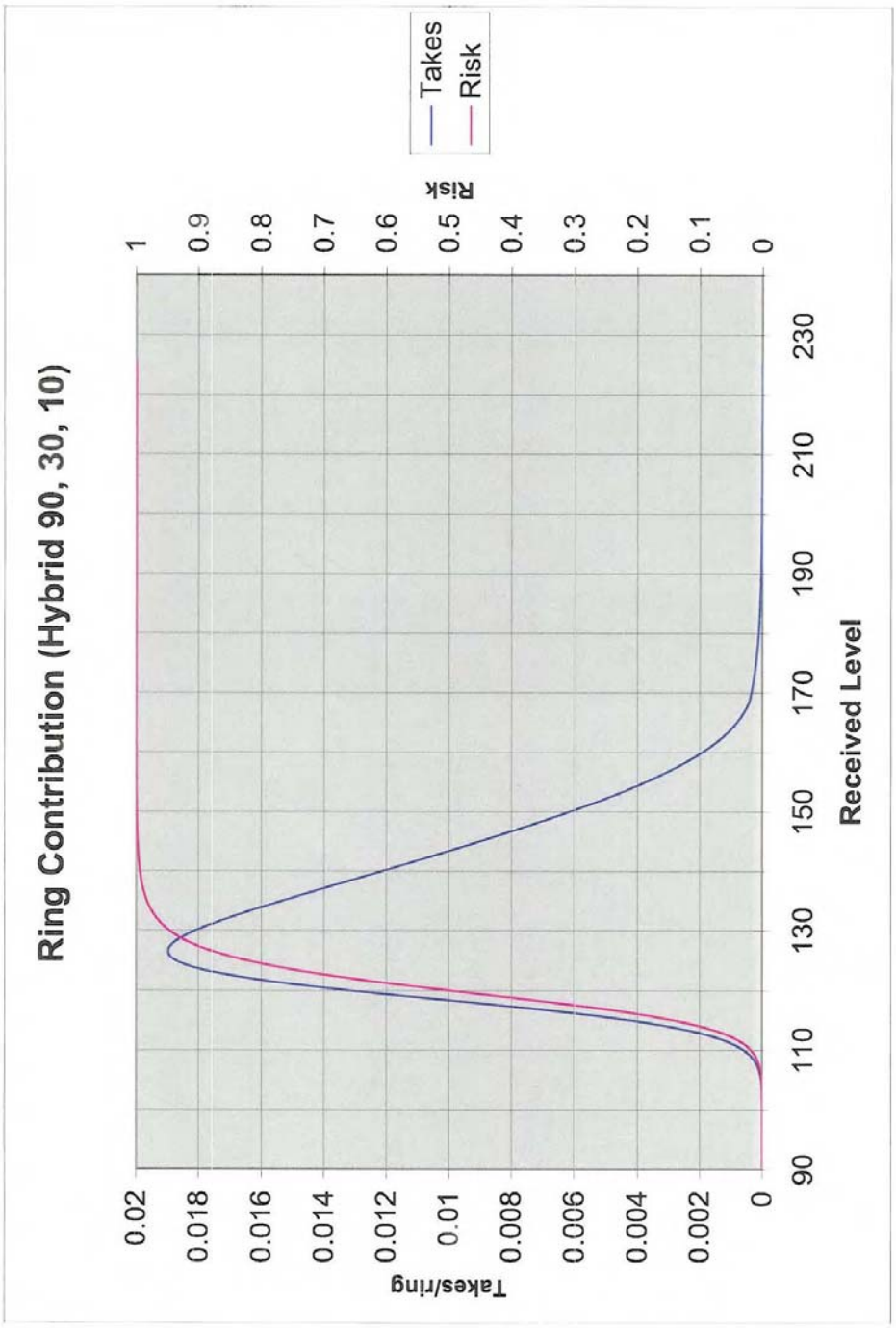
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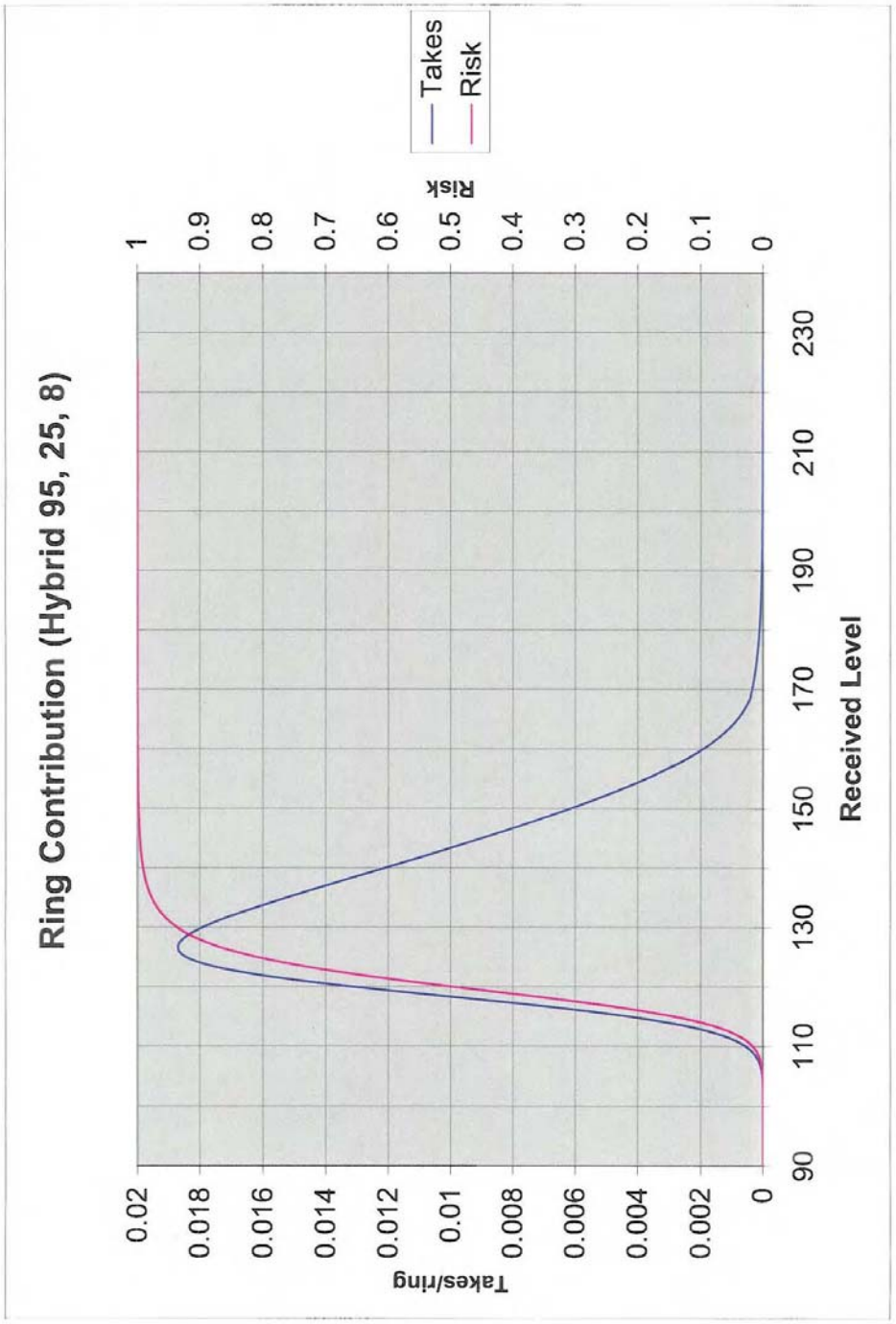
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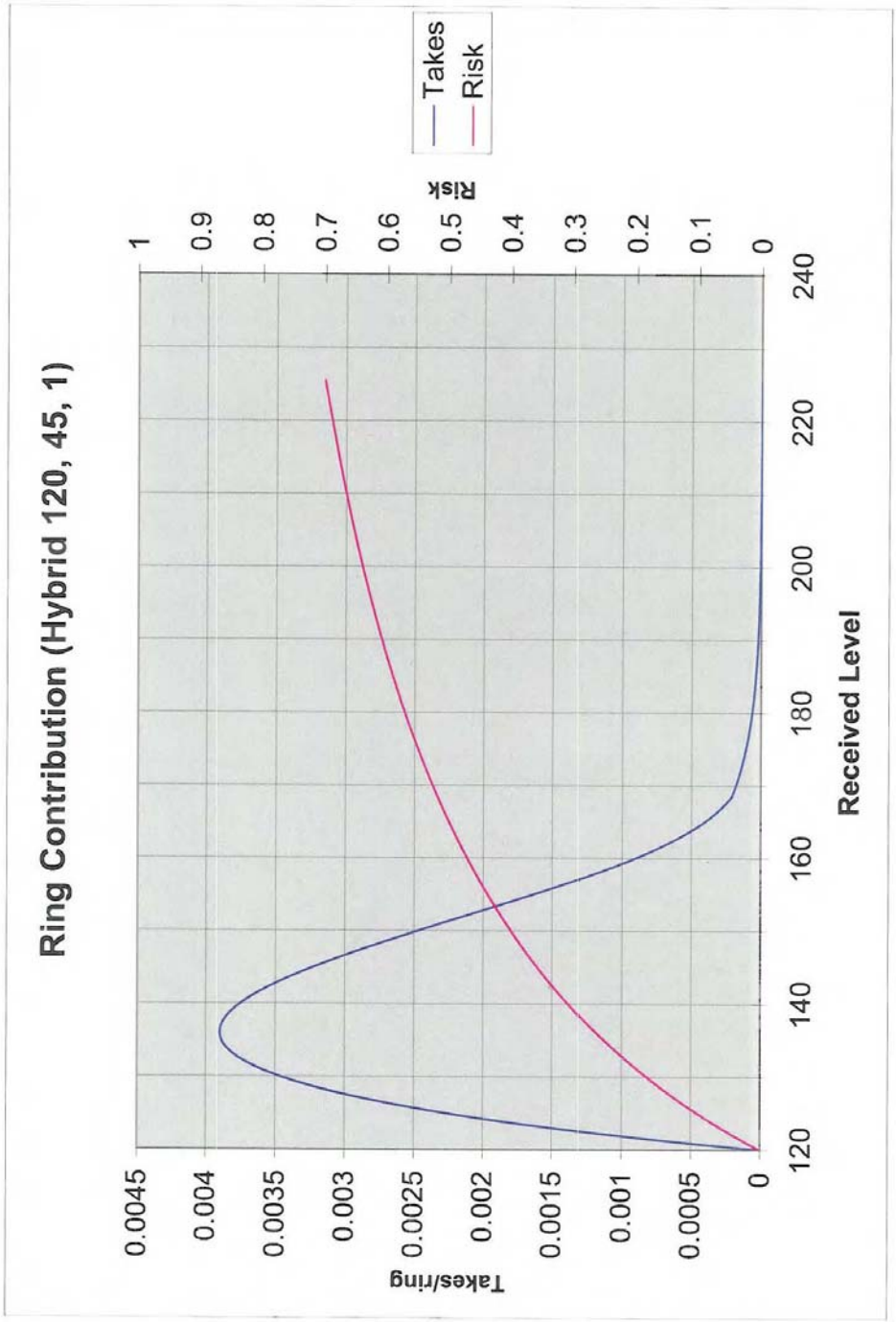

Ring Contribution (Hybrid 60, 60, 12)
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Takes/ring
Risk
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0.014
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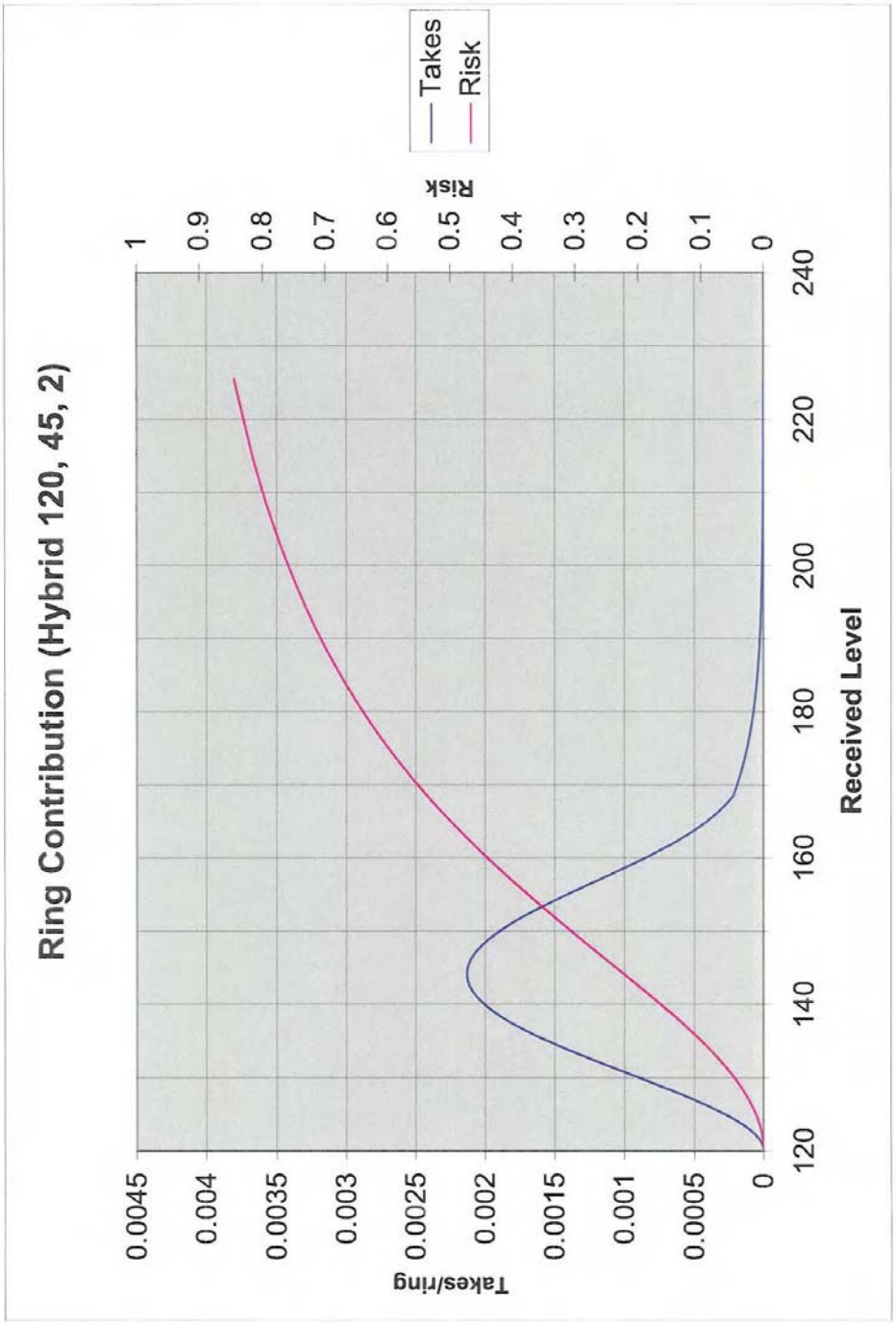

Ring Contribution (Hybrid 80, 40, 10)
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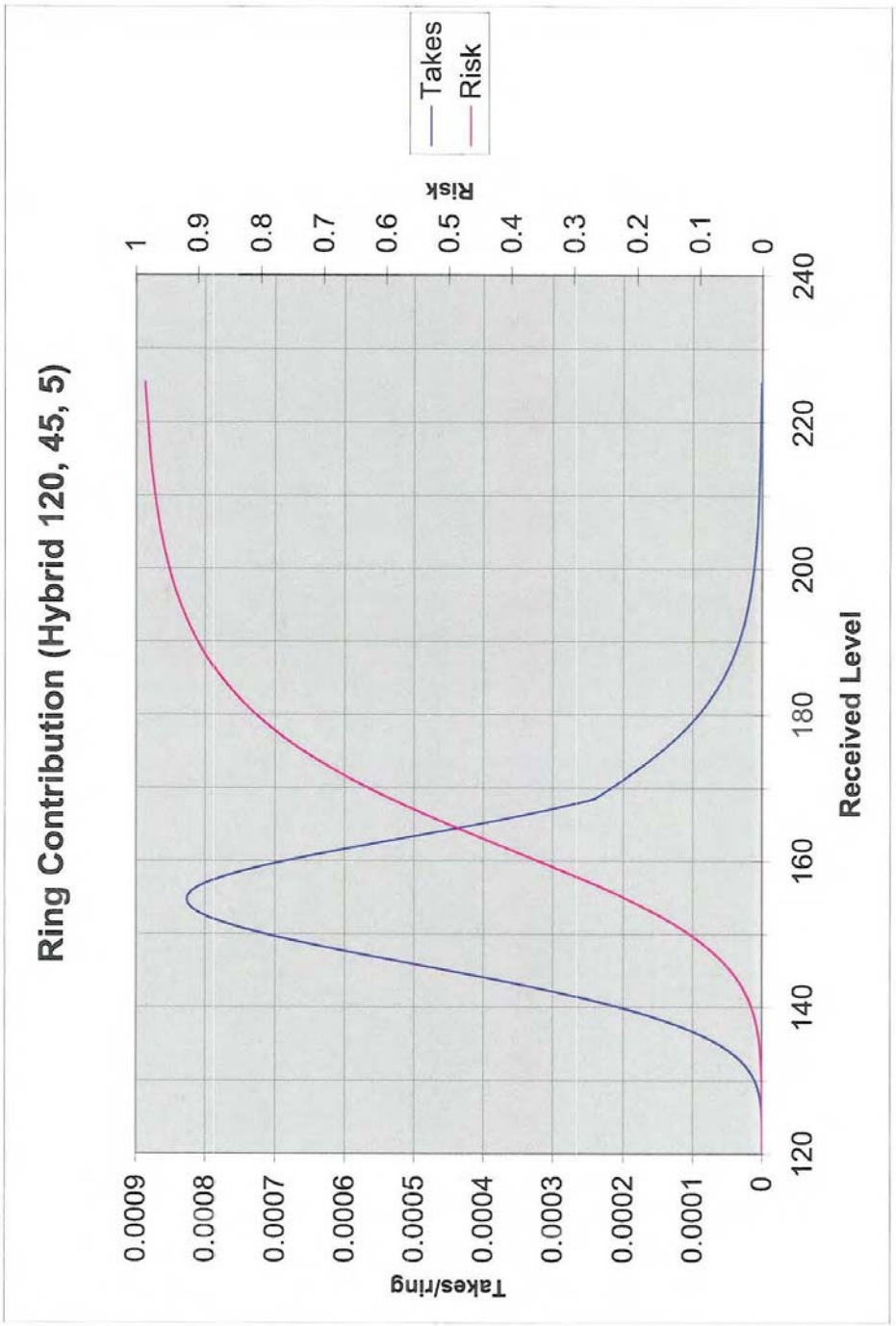

Ring Contribution (Hybrid 90, 30, 7)
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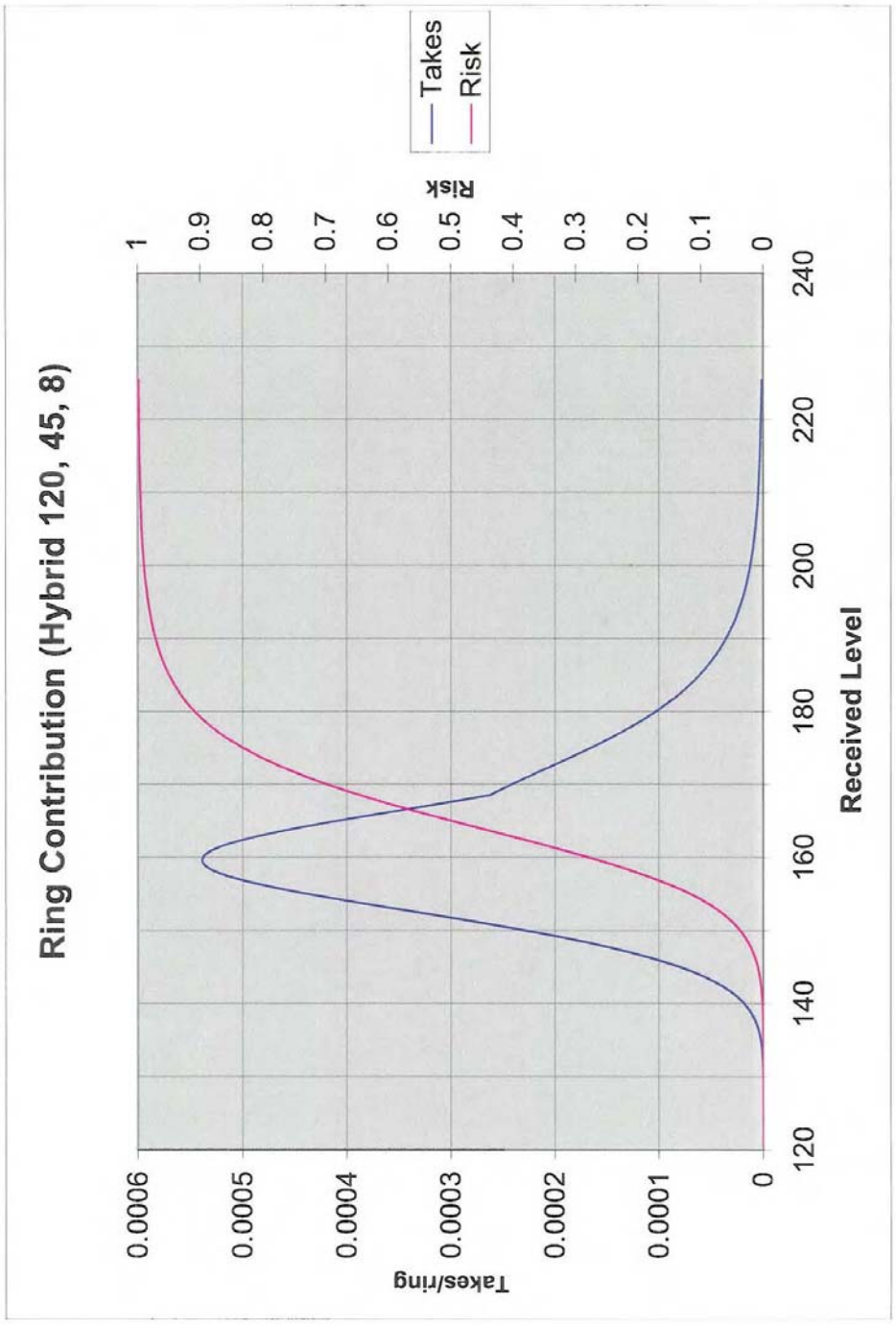

Ring Contribution (Hybrid 90, 30, 10)
Takes
Risk
Takes/ring
Risk
Received Level
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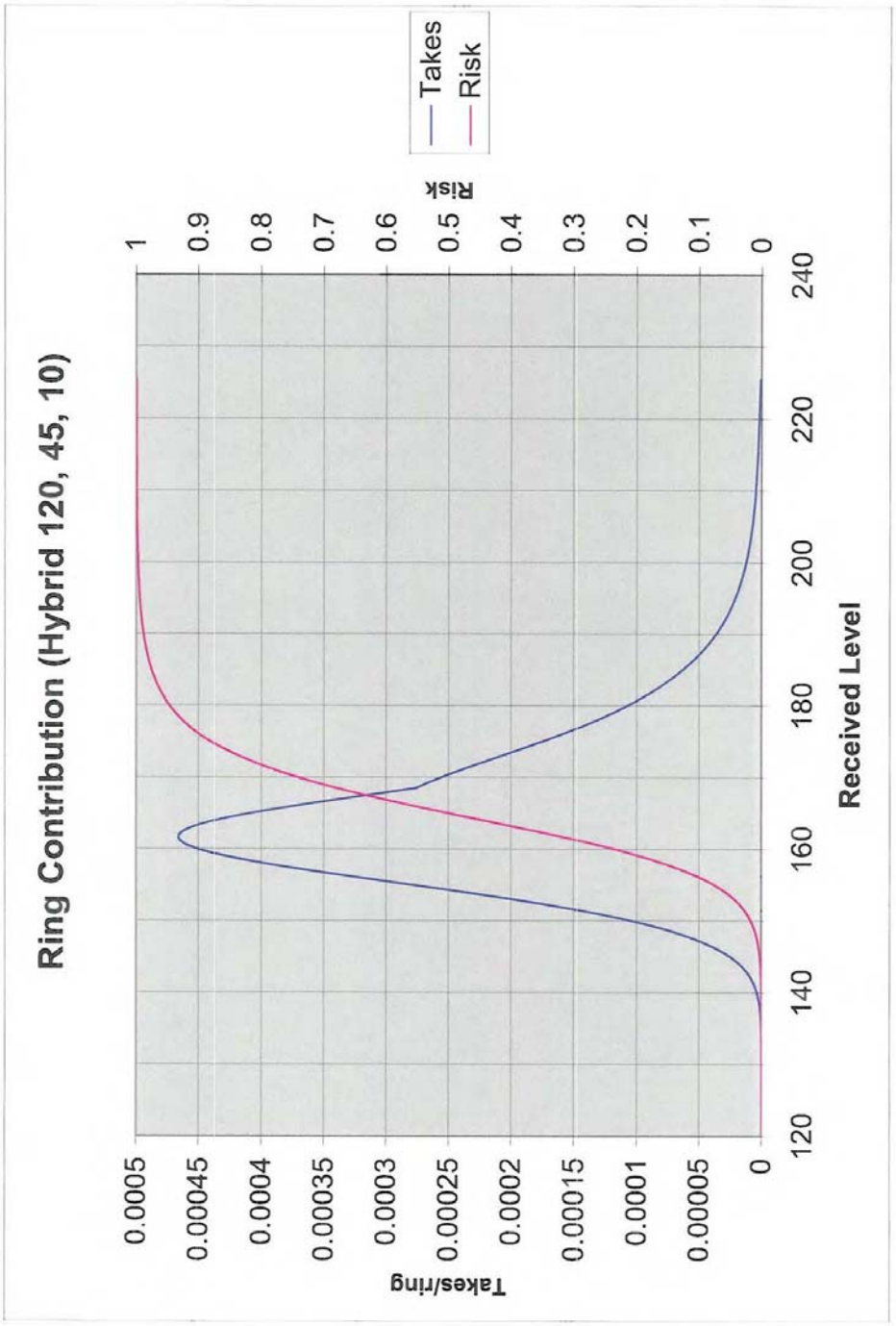

Ring Contribution (Hybrid 95, 25, 8)
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Risk
Takes/ring
Risk
Received Level
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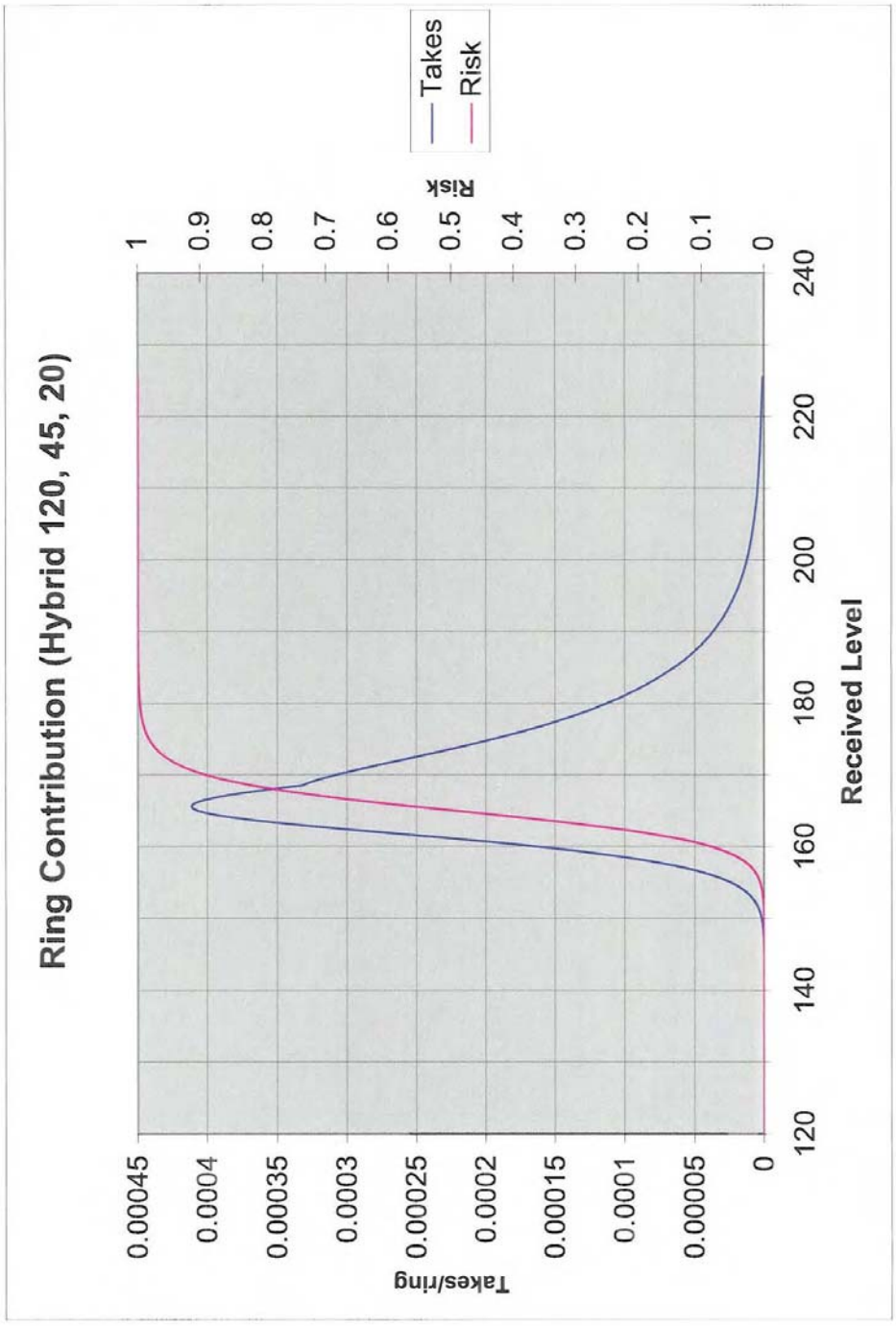

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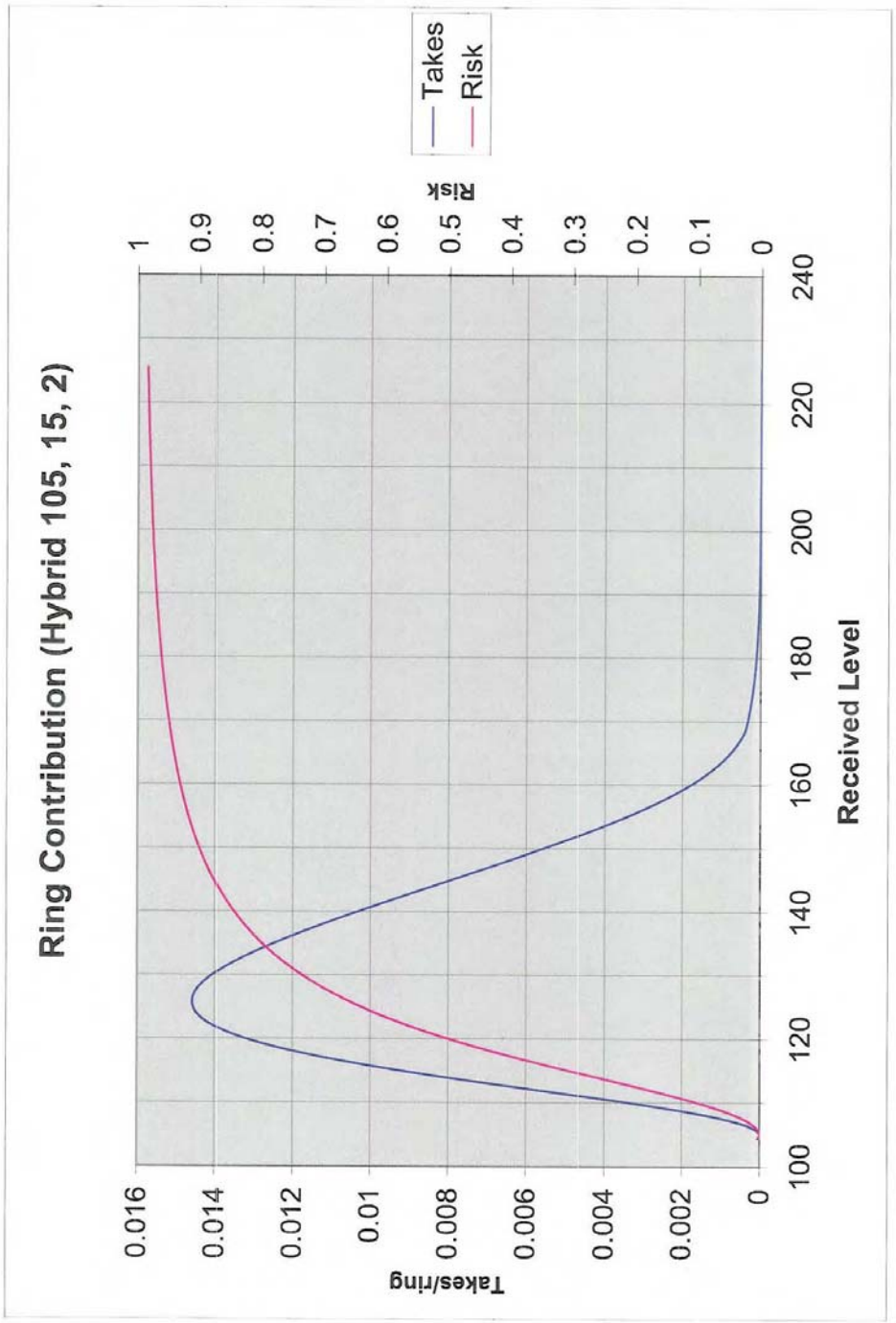

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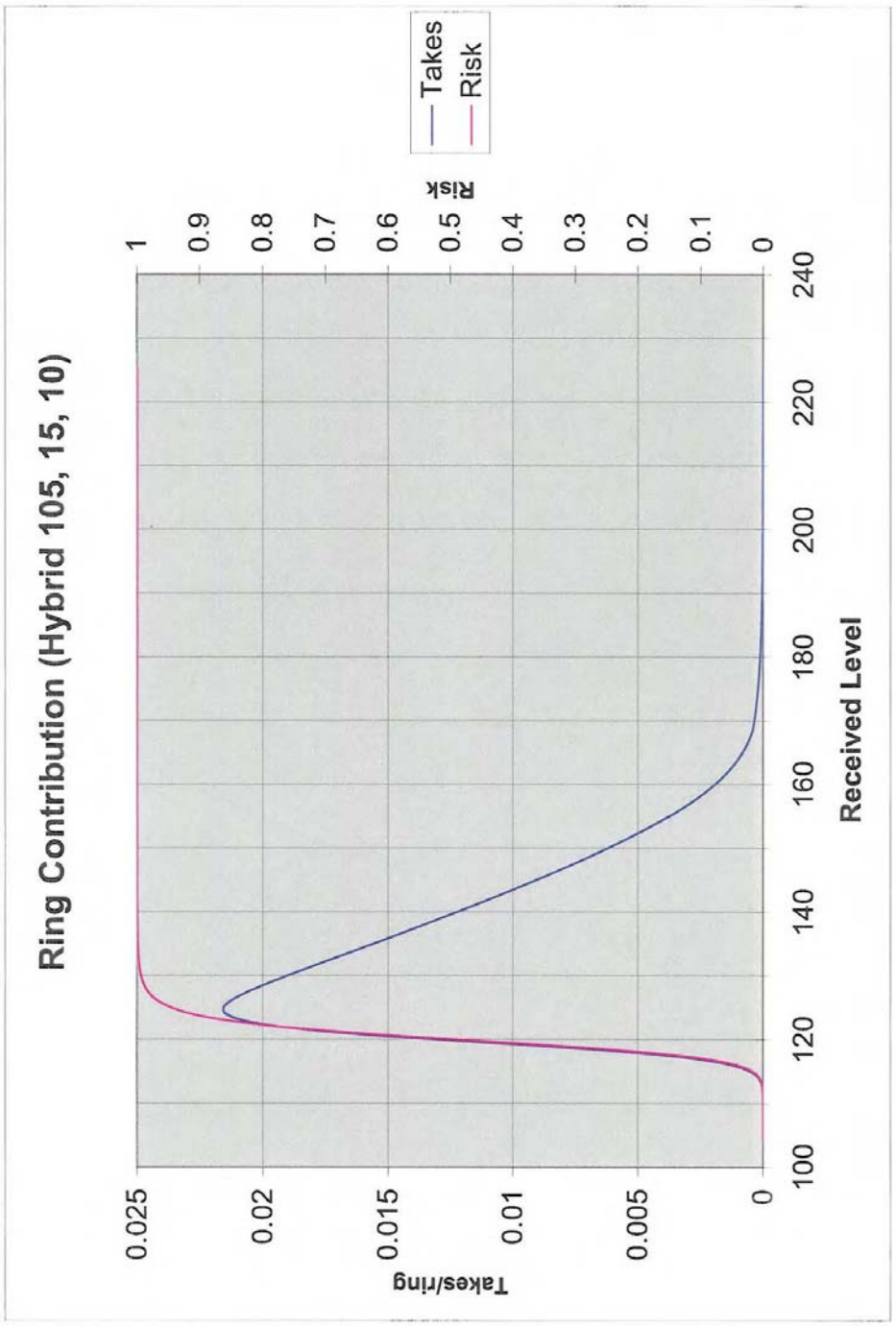

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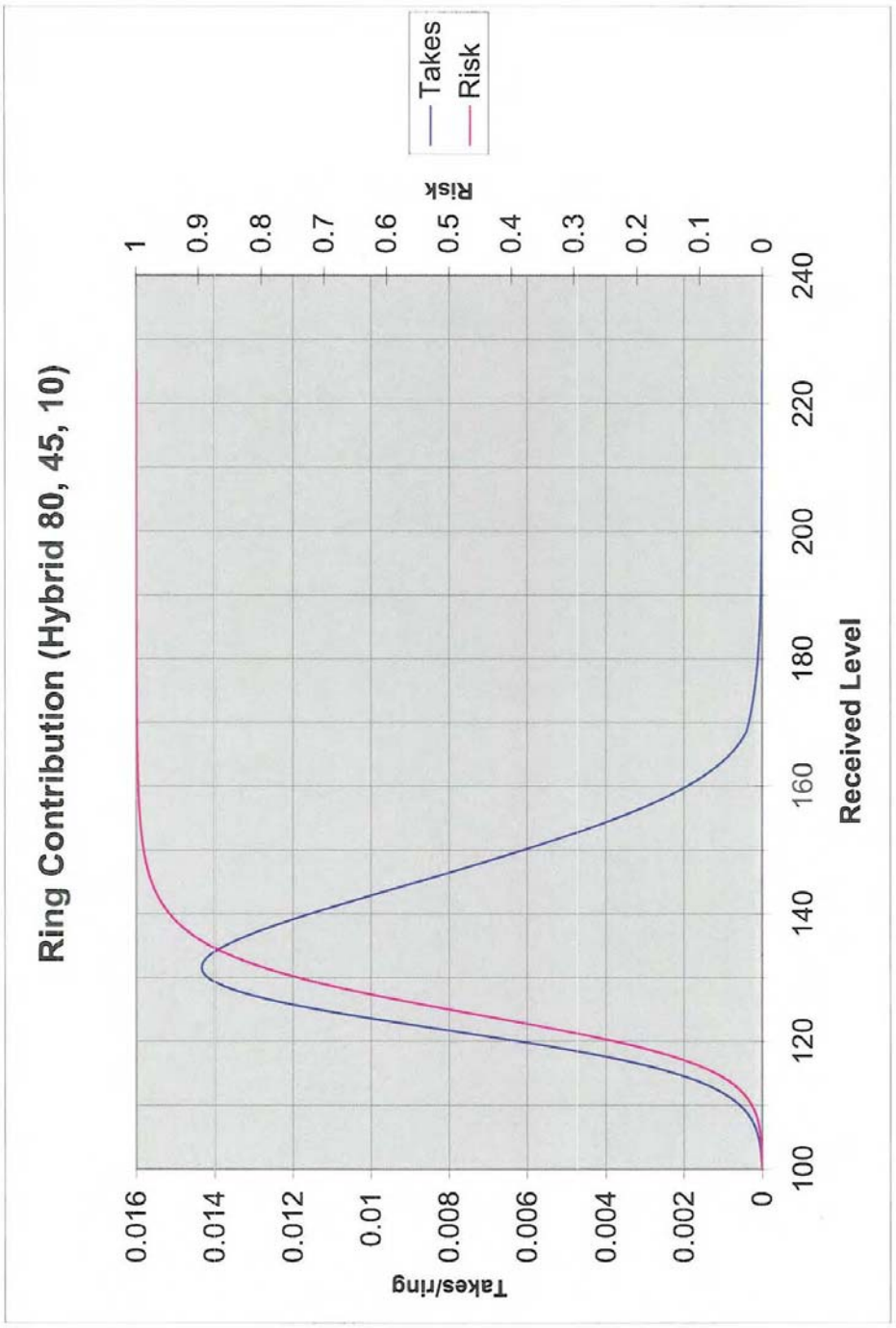

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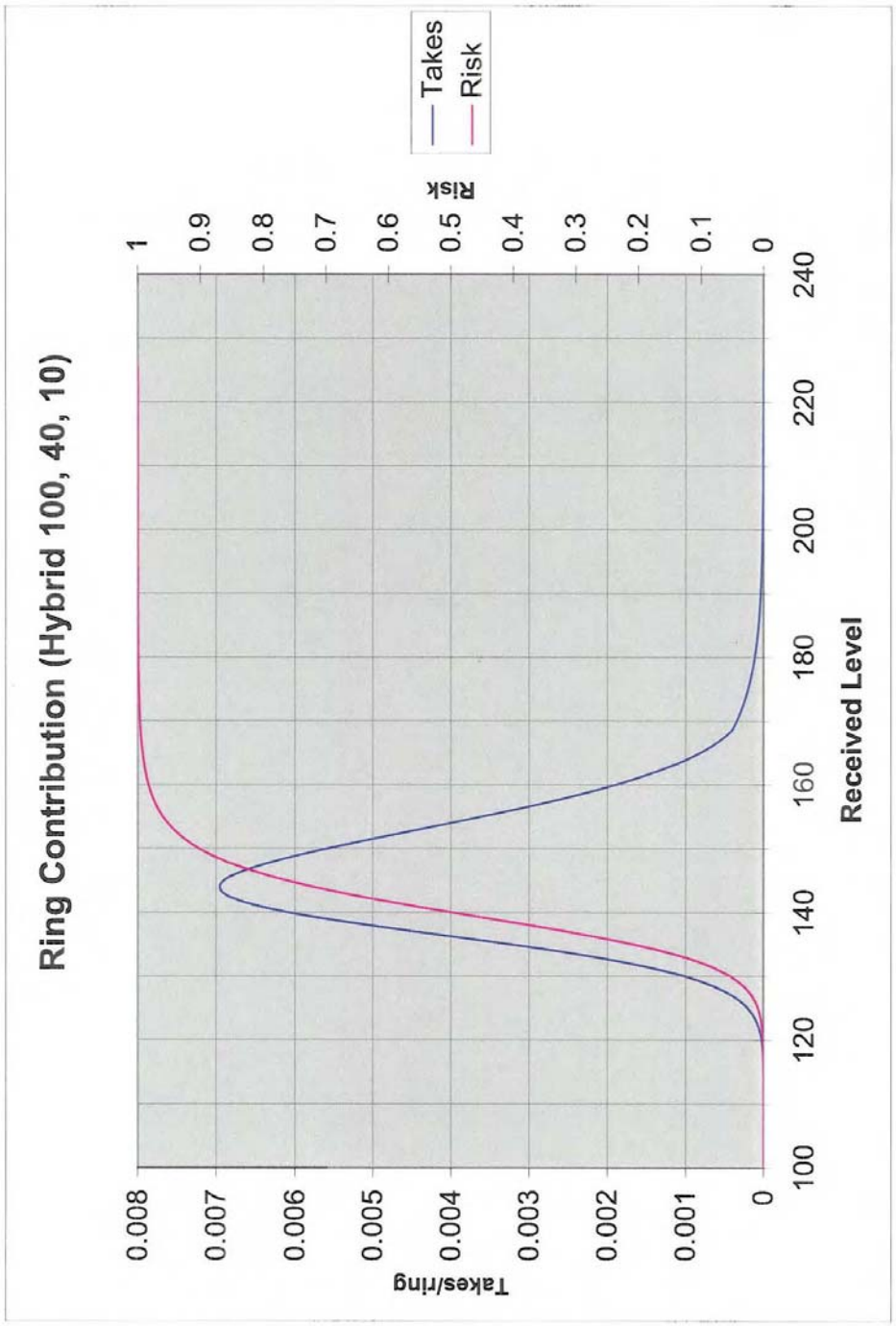

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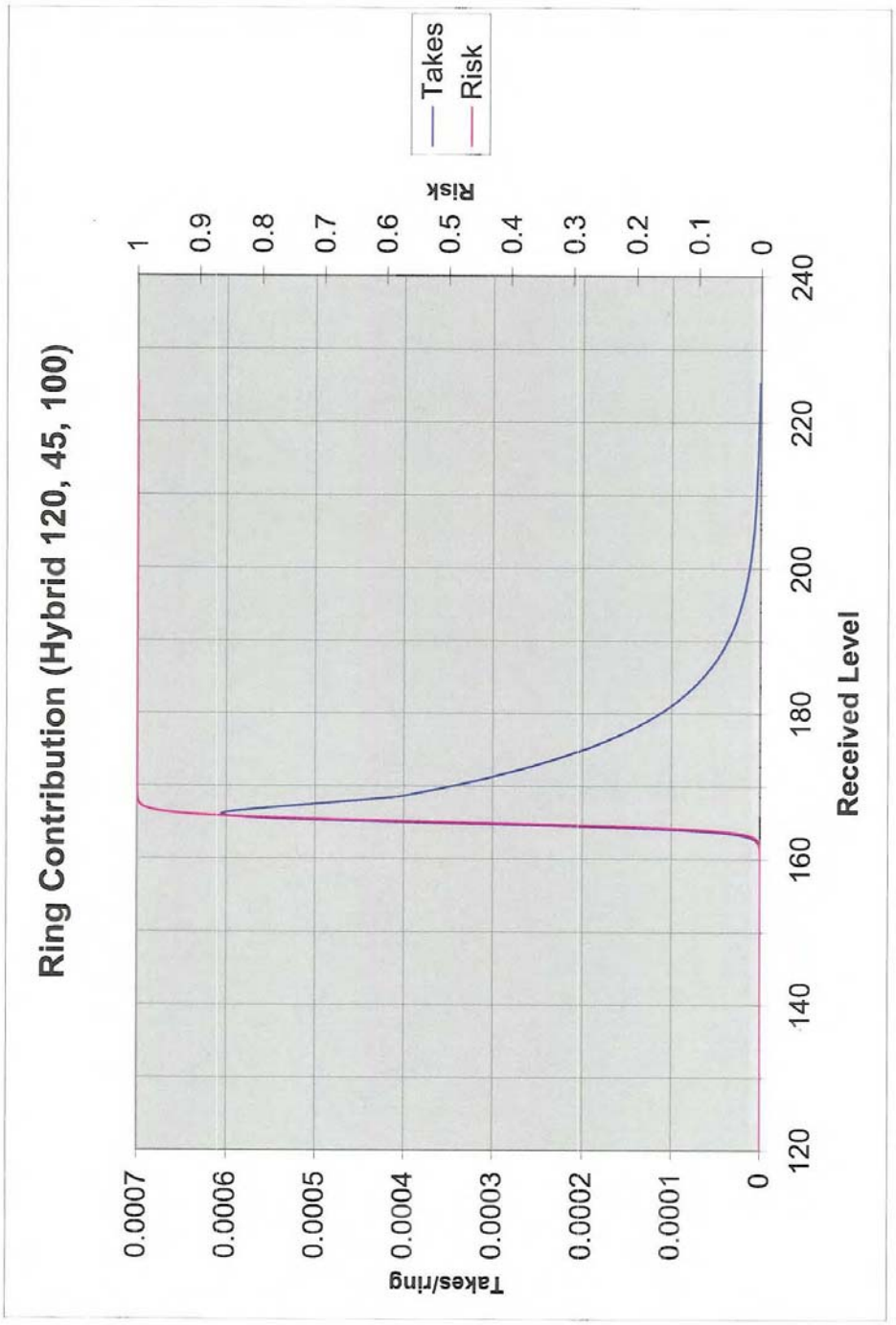

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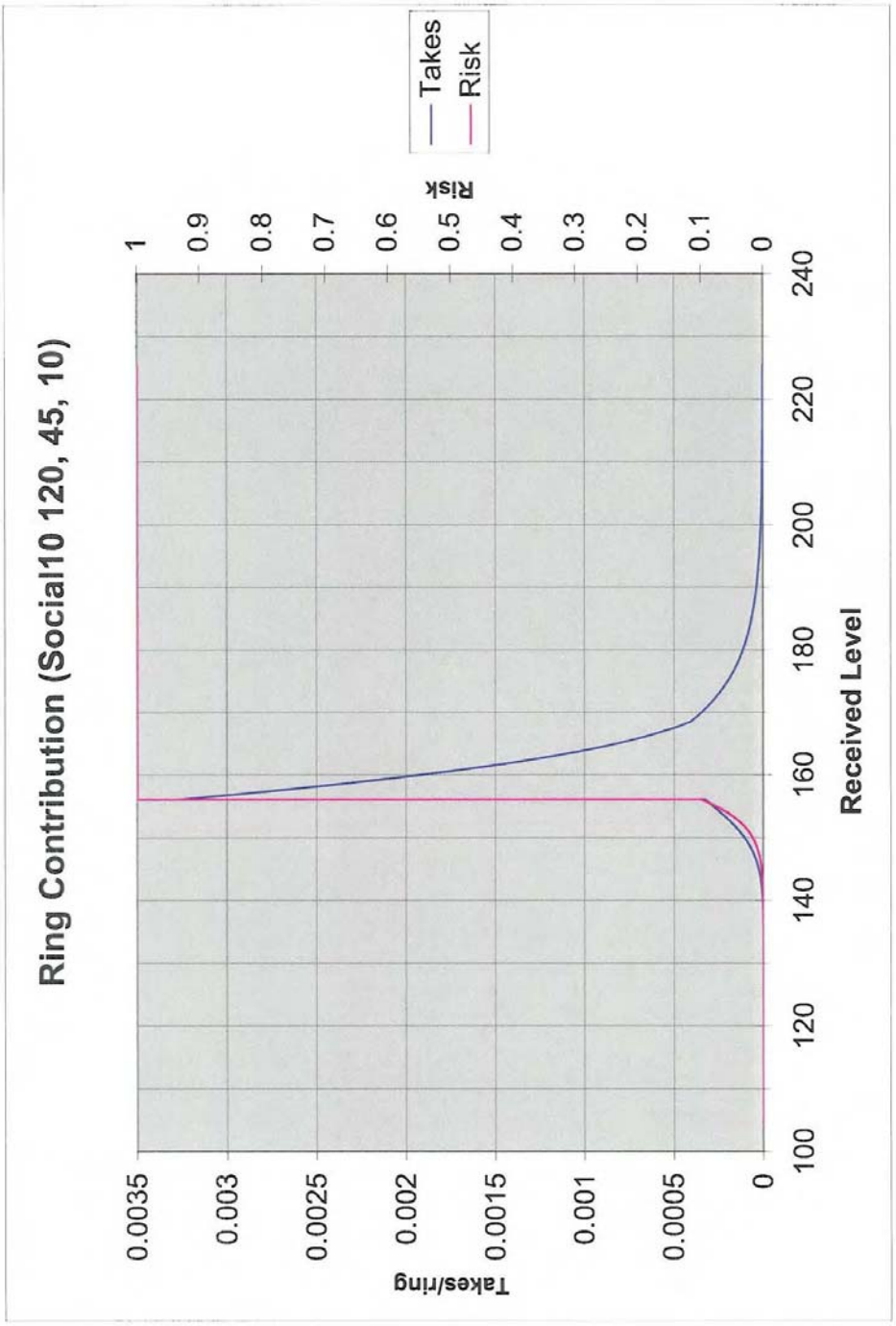

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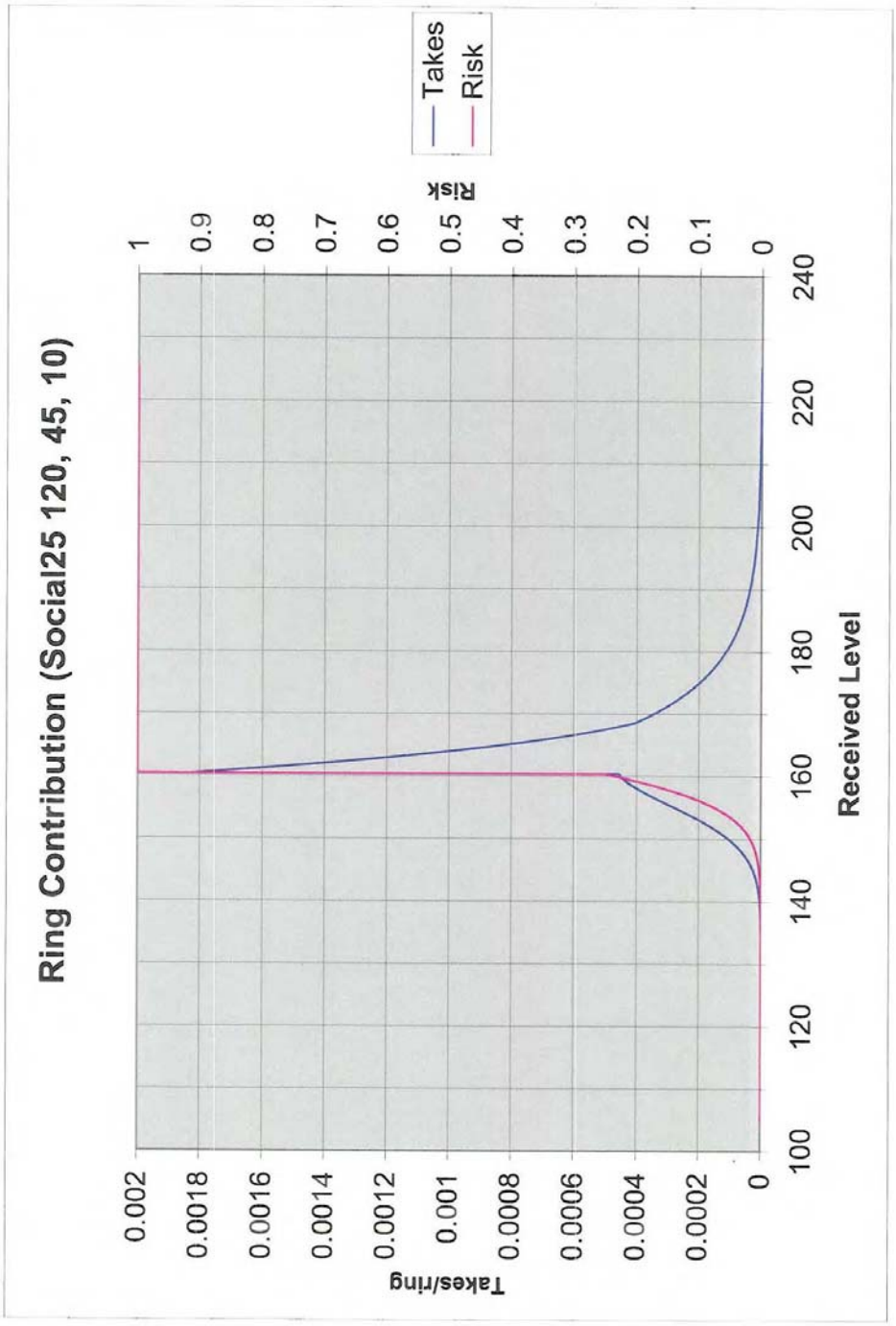

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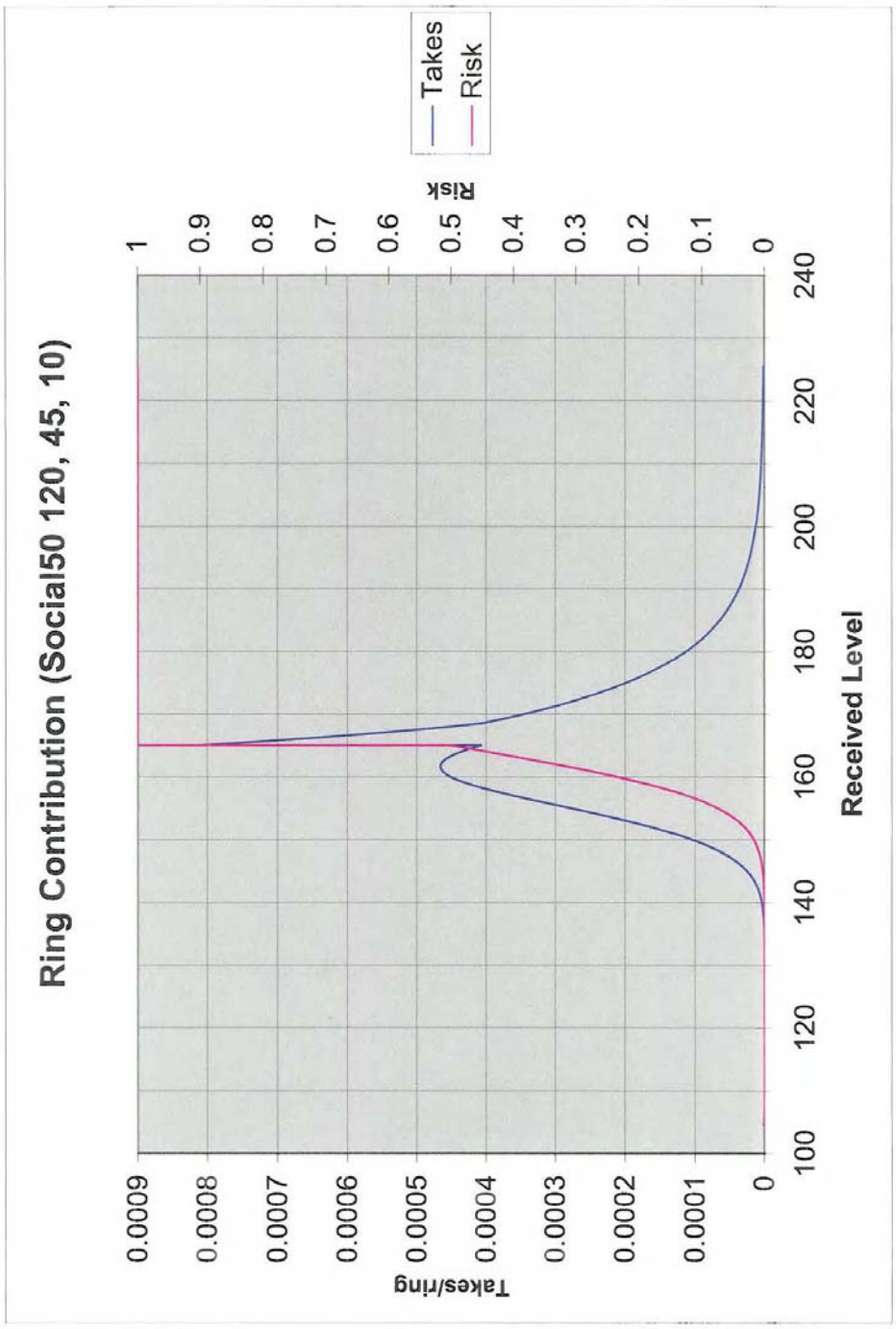

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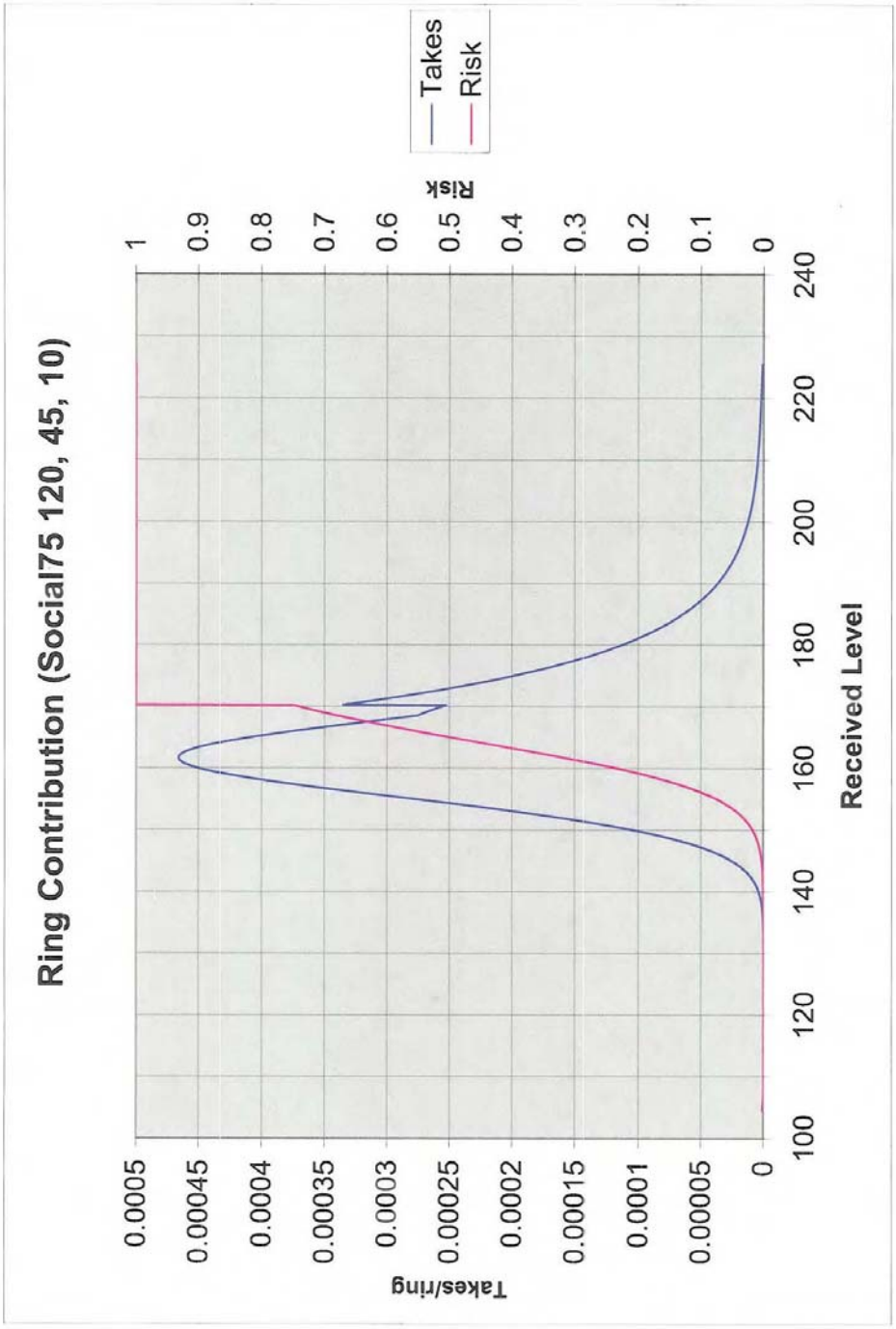

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I.1.29 OCEAN CONSERVATION RESEARCH - 1

OCEAN CONSERVATION RESEARCH

Science and technology serving the sea

Mrs. Amy Burt
Gulf of Alaska EIS/OIES Project Manager
Naval facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA
98315-1101

December 24, 2009

Ref: 5090 Ser N01CE1/1333

Re: Request for extension of public comment period.
Gulf of Alaska Navy Training Activities Draft EIS/OEIS

Dear Mrs. Burt,

We have just received this week (December 20, 2009) by US mail the Gulf of Alaska Navy Training Activities draft EIS/OEIS, with the enclosure letter dated December 4 2009. I can not attest to the reason for the late delivery as the envelope was not stamped with a postmark.

Nonetheless we believe that as was the case in the December 2005 issuance of the US Undersea Warfare Training Range (USWTR 70 Federal Register 62101-62103), the Gulf of Alaska Draft EIS/OEIS is far too lengthy and detailed, and far too important to have the public comment period constrained by a temporal conflict with the traditional American winter holidays.

Therefore we respectfully request that the public comment period for this document be extended an additional 10 business days from Jan. 25 to Feb. 8, 2010.

Extending the comment period would also be consistent with the extension given to the 2005 USWTR Draft EIS for much the same reason.

Additionally I am concerned that the public hearings are all limited to Alaska. While the proposed range is closest to that state, in is in both Federal and International waters and thus subject to the concerns of all US Citizens, not just Alaskans. We believe that asking concerned US citizens and marine stakeholders to travel to Alaska in the dead of winter poses an undue burden on those who do not live in Alaska, so we request that at least two public hearings be hosted in the lower 48 states, preferably in California and/or Washington DC. This would assure that a broad representation of citizens and

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stakeholders could become informed about the proposed training range, and provide comments for the record.

Thank you for your considering our request for an extension of the public comment period for the Gulf of Alaska Navy Training Activities Draft EIS/OEIS

Sincerely,

Michael Stocker
Director

Cc: Admiral Patrick M. Walsh
Commander
US Pacific Fleet
Department Of the Navy
250 Makalapa Drive
Pearl Harbor, Hawaii
96860-3131

2

I.1.30 OCEAN CONSERVATION RESEARCH - 2

OCEAN CONSERVATION RESEARCH

Science and technology serving the sea

Naval Facilities Engineering Command Northwest
Attn: Mrs. Amy Burt, Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Re: 5090 Ser. N01CE1/1333 Comments on the Gulf of Alaska Navy Training Activities Environmental Impact Statement/Overseas Environmental Impact Statement

January 21, 2010

Cc: Dr. Jane Lubchenco, Director, NOAA
Nancy Sutley, Chair, Whitehouse Council on Environmental Quality
Hon. Barbara Boxer, US Senate, Chair of Environment and Public Works.

Dear Mrs. Burt,

We have taken the opportunity to review the Draft Environmental Impact Statement for the Gulf of Alaska Navy Training Activities (GOA-DEIS) Temporary Marine Activities Area (TMAA). While the document reflects much work and a comprehensive exploration into the possible impacts of the proposed additional uses of the GOA as required by the National Environmental Policy Act (NEPA), we believe that the GOA-DEIS leaves much to be desired if it is to be considered a guiding document for environmental stewardship.

This observation is made in particular light of the fact that despite our assumptions about the boundless ability of the ocean to absorb the assaults of human enterprise we are rapidly finding that the ocean is in very poor shape. This is a consequence of reckless resource extraction (which is not under the Navy's purview) and relentless dumping and pollution (which is). The fact is that in many of the more extreme cases, ocean environmental degradation has been a significant product of the militarization of ocean habitats.

We are seeing that the long term accumulation of toxics and "inert" trash is causing global scale problems with impacts on all marine biota. We are seeing the gradual and

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slow release of chemicals bio-accumulating and bio-concentrating throughout the entire food chain – including in humans, who consume the products of the ocean at the highest trophic levels.

Bio-accumulation and concentration of toxics had not been part of the models used when decisions were made to use the ocean as a chemical toilet. But now we know better. We also know that some chemicals once thought of as benign are having profound effects on biological function such as compromised reproductive health, mutation, carcinomas, and neurological damage in "parts per trillion" concentrations. Knowing this, it is unconscionable to continue to treat the ocean as a toxic waste dump.

While many of the toxic substances in the ocean are a product of civilian dumping and unintentional runoff from terrestrial as well as marine sources, a preponderance of terrestrial Superfund sites are due to reckless military hubris. There is no indication that the Navy has been any different in their stewardship of the sea. This is substantiated in our comments to the GOA-DEIS herein.

The GOA-DEIS largely concerns the addition of Anti-Submarine Warfare (ASW) activities currently not included in the existing training range and operations. As such the proposed operations will be introducing an acoustical systems component to the training range. This includes both the introduction of acoustical energy into the environment, as well as chemicals and other pollution from expendable materials, acoustical systems, and associated equipment. It also includes an extra component of underwater explosives – used for acoustical signals as well as for weapons ordnance.

I am limiting our comments to impacts on fish and marine mammals; and while the main focus of Ocean Conservation Research is the bio-acoustic impacts of human generated noise on the marine environment, I also include our concerns for chemical pollution in the training area. The models and assumptions used in the GOA-DEIS for chemical and toxics "mitigation" serve as a philosophical as well as a systematic model for noise pollution inasmuch as that while the jurisdiction and management of the training range fits within prescribed borders, acoustical energy and chemical pollutants, and their impacts on marine life and environment that would result from the proposed exercises are not so tidily constrained.

Symptomatic of this is that while the dumping of expended materials under "Alternative 1" and Alternative 2" is not increased within US territorial waters (which are subject to NEPA and other US environmental laws), there are substantial increases of expendables dumped in non-US Territorial waters (which are not subject to US environmental laws).

This situation clearly illustrates the effectiveness of NEPA in protecting US territorial waters, but is also shows the "avoidance relationship" that the US Navy has for NEPA and by extension other US environmental laws.

The overarching problem here is that while the jurisdictional boundaries of US environmental laws are clearly defined at 12 nm from the US Coast, energy and chemical pollutants and other destructive practices in the ocean are not subject to those boundaries. Animals impacted by reckless dumping practices, marine mammal acoustical "takes," damage to fish and fisheries food-stock (and habitat) are all trans-boundary problems in the ocean. And just because an animal or habitat is outside of US jurisdiction, it does not mean that the damage is any less grave than damage that occurs within US territorial waters.

The boundaries of our Federal laws are practically established as a consequence of the likelihood of enforcement, not as an expression of diminished impacts. If the US Navy is to uphold laws which express the priorities of the American People, the impact categories outlined in the various tables and "Environmental Consequences" statements in the GOA-DEIS[1] belie the Navy's stated concern to be "stewards of the sea."

It is within the context of the US Navy's responsible stewardship of the ocean – along with the understanding that the ocean is in terrible shape – that I submit the following comments and concerns for the proposed activities in the Gulf of Alaska Warfare Training Range.

Our overarching recommendation is the "No Action Alternative" and to not include ASW training exercises proposed in either Alternative 1 or Alternative 2 in the Gulf of Alaska Temporary Marine Activities Area (TMAA) for the following summary reasons:

- It is becoming increasingly and shockingly clear, the ocean is in precarious shape due to continuous and expanding insults of human enterprise and adventure. This must figure into all of our deliberations and practices that compromise ocean habitat.
- Of all ocean areas within US Territorial reach, the Gulf of Alaska is one of the least assaulted areas and should remain so.
- The US Navy has recently expanded Anti-submarine Warfare training areas in Atlantic (USWTR), the Northwest Warfare Training Range Complex, Hawaii Range

[1] The jurisdictional distinction is made throughout the GOA-DEIS as to whether the impact standards – and thus mitigation thresholds, adhere to NEPA (inside 12 nm) or Executive Order [EO] 12114 (outside of US Territorial waters).

Complex, and the Southern California Warfare Training Range Complex. Adding the Gulf of Alaska is not justified by any scarcity of other training areas.

- The chemical, toxic and "inert" pollution models used in the GOA-DEIS are over-simplistic and do not take into account current state of knowledge about accumulation and concentrations of chemical, toxic, and "inert" pollutant behavior throughout the entire ocean, and up and down the entire food chain – including humans.
- Insufficient data provided on the sonar characteristics and source levels so a complete assessment of the potential impacts presented in the DEIS are incomplete.
- The bio-acoustic impact models used in the GOA-DEIS are over-simplistic and do not represent wild animal impacts or behaviors and do not account for the agonistic qualities and characteristics of the various signals that would be introduced into the environment.
- Mid and high frequency sonar acoustic impact data on fish is lacking and does not justify the DEIS conclusion that impacts are "negligible or non-existent."
- The mortality "risk continuum" for fish due to explosives is inadequate and suspiciously biased to appear much more benign than it is.
- The conclusion in the DEIS section on fish admits that very little is known about the impacts of sonar on fish – which contradicts the summary table statement that "sonar used in Navy exercises would result in minimal harm to fish or EFH."
- The exposure risk models of marine mammals appear to contain many examples of "statistical manipulations of convenience" which erodes both the credibility of the models and the integrity of the entire GOA-DEIS.
- The model of bio-acoustic impact of explosives on marine mammals is over simplistic. It models the animals as "linear input devices" and does not account for synergistic effects of stress on the animal or the destruction of habitat and food sources.
- The issuance of the DEIS over the winter holidays – truncating the available comment period is cause for suspicions that the Navy is disingenuous about seeking public input on this cumbersome, comprehensive, but nonetheless inadequate document. This established a justifiable foundation of mistrust as we evaluated the document.

We have substantiated these assertions below. Given the limited time that was available for review we had to focus on the more obvious concerns. If we actually had the full 45 days required by NEPA not interrupted by holidays and obligatory year-end activities our comments would be much more comprehensive and informative. Nonetheless we were able to provide the forgoing, which more than adequately substantiates our recommendation that the "No Action Alterative" is the preferred alternative for the GOA-DEIS.

"Expended Materials"

While Ocean Conservation Research is focused on understanding and finding solutions to the impacts of human generated noise on marine life, we are compelled to comment on the chemical, toxics, and "inert" pollution from expended materials in the proposed DEIS. This is because, as indicated above, this dumping of chemicals in the ocean needs to be curtailed. The US Navy's continued disregard for the mounting biological evidence that chemicals are seriously impacting the global ocean is indicative of a larger hubris that plagues the entire GOA-DEIS.

This hubris is characteristically represented in the following comment from the Executive Summary section Table ES 3.1:

> "Outside of U.S. territory, air pollutant emissions would increase substantially, mainly from increased surface vessel and aircraft activities. • SINKEX would generate a substantial portion of the air pollutants that would be emitted under Alternative 2. • Although Alternative 2 would increase emissions of air pollutants over the No Action Alternative, emissions outside of U.S. territorial seas would not cause an air quality standard to be exceeded"

Believing that air pollution (in this case) or marine pollution respects US Territorial boundaries is particularly short sighted in light of what we know about air and ocean circulation patterns; especially in the GOA and arctic waters.

Also in Table ES-3: Summary of Effects: "Expended materials under Alternative 2 would not have a substantial effect on the marine environment." The phrase "substantial effect" needs to be more clearly defined, because the numbers and weights of materials expended annually (under preferred Alternative 2) provided in Table 3.2-18 and Table 3.2-19 indicate 10,000 lbs. of hazardous materials per year. Without even evaluating the toxicity of the specific materials, 10,000 lbs. per year is not insignificant.

Our current state of knowledge about the impacts of hazardous substances on marine life, and the effects of bio-concentration as hazardous materials move up the trophic levels do not constitute an inconsequential impact. Hazardous materials are not static; they are hazardous because they are dynamic. And just because a deposit of hazardous materials might be statistically hard to detect, we can assume that over time the accumulation of these materials in the environment will have negative impacts on marine life.

Additionally, framing the hazard in long time frames does not decrease the impacts. For example on page 3.2-12 we find "In instances where seawater corrodes the sonobuoy, that corrosion takes at least 40 years."

What will happen after 40 years? Will the ocean be somehow immune to the effects? And on page 3.2-23 "Most of these materials are relatively inert in the marine environment, and will degrade slowly." What does "relatively inert" mean?

Throughout the "Expended Materials" section we find the repeated use of the phrase "quickly dispersed by (or diluted by) ocean and tidal currents" troubling. It seems that the US Navy assumption is that once dispersed outside of the training range that the substances are no longer a problem. But we have found that chaff, plastics, and drifting chemical pollutants are a significant and growing global environmental problem because ocean currents end up pulling them into oceanic gyres where they end up in dangerous concentrations, polluting the food supply from the lowest trophic levels on up. While much of this has been accidental or incidental to global consumption, the US Navy deliberately adding to this mess – particularly with known military toxins is unconscionable.

Acoustic Impacts

While we know that the ocean is largely an acoustic environment, the understanding about role of acoustics across the vast array of marine animals is rudimentary at best. In some cases we have not been able to procure evidence that our noises have any impact at all, and in other cases we are baffled by the extreme impacts that human generated noise has wrought on marine life.

As we roll back the frontiers of our ignorance it will be wise to assume precaution. This would mandate that we gather as much evidence as possible and populate our models with the most accurate, concise, and up-to-date data as possible.

We are concerned about the impacts of the noise generated in the training range on marine animals both inside and outside of the training range. This includes impacts on migratory and resident marine mammals as well as migratory and resident fish - particularly fish with a high commercial value, including but not limited to salmon, halibut, herring, haddock, Pollack, and crab, the consequent impacts on the commercial fishery, and the consequent impacts on links in the regional food chain.

Noises of concern are the noises from explosive ordinance, mid-frequency sonar, sonar jamming signals, communication and surveillance sonar, and mechanical noises

associated with warfare exercises such as engine noise, propeller cavitation, and through-hull transmitted mechanical noise.

One of our dominant systematic concerns expressed throughout this document is that a preponderance of audiometrics for fish and marine mammals are derived from laboratory test signals that have very little correlation to the exposure signals of concern – particularly the various acoustic communication and sonar signals.

This situation is exacerbated by the presentation of sonar systems in the DEIS Appendix H "Acoustic Systems Descriptions" section wherein the various acoustic systems were generally described and qualified in terms of their frequency bands (Low, Mid, and High frequency) but source levels were not provided, and in most cases there was no indication of signal qualities (e.g.: short "pings" or longer data-streams). Both exposure levels and signal qualities have bearing on the biological impacts so a complete assessment of the potential impacts presented in the DEIS are incomplete.

This is also the case with the Portable Undersea Training Range (PUTR) (section H.1.9) in terms of transponder frequencies, source levels, and signal characteristics.

Without knowing more about the signal characteristics of these devices it is impossible to derive and accurate impact model; to determine how different these signals are from the audiometric signals used to establish auditory thresholds in subject animals, or determine if there are acoustical characteristics of these signals that may be of greater concern than just their amplitude.

Seminal to this discussion is the assumption that all hearing animals have a need to discriminate pitch. While mammals, including marine mammals, have organs of pitch discrimination (the cochlea) it is not clear that any other animal family has a need to discriminate pitch. It is likely that other animals have acoustical perceptions tailored to their specific habitat priorities that do not include pitch discrimination.

Almost without exception, all audiograms taken of marine animals are a comparison of frequency and amplitude sensitivities. It is possible that in lieu of pitch and level perceptions, that many fish (or other marine animals) could be sensitive to other characteristics of acoustical energy; that in place of level or time-of arrival differences between sound receptors, these animals can distinguish phase differences between 'particle' and 'pressure gradient' acoustical energy. In this context, time-domain cues across these physical characteristics of acoustical energy are much more important than frequency or amplitude cues.

This could cut both ways in regards to the acceptable noise levels for fish in the subject environment: Up to the point where the acoustical mechanics of the noise in the environment and the acoustical compliance of the organism are in conflict with the noise levels, a particular fish may not even perceive the noise. This would explain why fish residing in extremely turbulent settings (like corvina or surf perch) can endure extreme, noise-saturated acoustical settings and still respond to subtle acoustical stimulus in their environment.[2] This could mean that very loud but distant noise sources might have much less impact on an animal than quieter but closer noises.

This is germane to the DEIS because the preponderance of audiograms and threshold shift procedures used to determine the acoustical sensitivities of fish in the cited studies[3] used either sinusoidal signals or band limited 'pink' noise[4]. While this statement doesn't answer many questions in regard to the impacts of the noise generated by the proposed TMAA project on various fish exposed to the noises of the program, it highlights the fact that the assumptions used to frame the impact models do not reflect the actual acoustical situation proposed in the program. This is particularly evident in the fact that some of the proposed acoustical signals will not be sinusoidal, rather some signals will include fast rise times and high "crest factors"[5] which are significantly different from sinusoidal signals.

This shortcoming can only be addressed by doing systematic testing on various fish using signals and levels that more closely match the signals proposed for the TMAA, especially the mid frequency communication sonars that overlap the known audiological response of the subject fish and contain either rich harmonic content, fast rise times, and crest factors at or above unity.

Using the actual sonar signals to determine acoustical thresholds would also clarify the impacts of the proposed signals on other marine biota, where again the preponderance of audiological or physiological impact data are taken from sinusoidal or 'pink noise' sources.

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[2] J. Engelmann, W. Hanke, J. Mogdans & H. Bleckmann "Neurobiology: Hydrodynamic stimuli and the fish lateral line" 2000 Nature 408, p.51-52

[3] The GOA-DEIS cites Scholik and Yan, 2002 and Wysocki and Ladich, 2005. These studies also evaluate three fresh water species: The goldfish (*Carassius auratus*) and the Rafael catfish *Platydoras costatus*) both live in still, turbid waters, (thus their particular acoustical adaptations), and the sunfish (*Lepomis gibbosus*), a clear water inhabitant. These animals are not good models for open ocean fish that live in a completely different acoustic habitat.

[4] Band limited "Pink Noise" is typically derived from Fourier Transfer derived Gaussian noise constructed from sine waves without any coherent time-domain component.

[5] Crest factor is the ration of peak to RMS value of a signal. Pure sinusoidal waves have a crest factor of .707; pure "square waves have a crest factor of 1; repetitive impulse sounds have a crest factor greater than 1.

Marine invertebrates have mechanoreceptors that are adapted to the sinusoidal motions of their environment. Sometimes these motions are relatively energetic (such as the acoustical energy generated by heavy currents and wave motions), so these animals may not be as affected by extreme sinusoidal energy. On the other hand, fast rise times or high crest factors used in some acoustical communication signals may exceed the acoustical compliance of the organism and damage it. These types of signals need to be explored with various marine invertebrates and plankton prior to excluding all of these animals from consideration of acoustic impacts in the GOA-DEIS.

Acoustic Impacts: Fish

In chapter 3.6 on fish, and most notably under section 3.6.2.2 Assessment Framework it is stated repeatedly that there are many data gaps in the literature on the impacts of noise on fish. The remark that "it is hard to extrapolate between species or conditions" is abundantly found throughout this section, substantiating the general position that there is a high level of uncertainty in the known impacts of noise on fish.

But the absence of data does not mean the absence of harm, and precautionary practices would dictate that some known statistical mean of harm would be used to set mitigation thresholds. What is done throughout this section ambiguates the probable impacts with biased metrics. For example the correlation of impulse impact mortality relative to body mass and charge size taken from Young's equations[6] were extrapolated into tables 3.6-4: "Range of Effects for at-Sea Explosions" and table 3.6-5: "Estimated Fish-Effects Ranges for Explosive Bombs" to indicate the distance at which 10% mortality would occur (also noted as "90% survival" in the DEIS.)[7]

This metric ambiguates the perspective that fish at or *outside* of the specified range have a 10% or greater survival rate. There is a mortality continuum from 10% - 100% mortality *inside* that range. So while for example only 10% of the fish greater than 30 lbs will be killed at 578 feet by a 500 lb. bomb, it is highly likely that the death rate will be significantly higher for smaller fish with the mortality continuum scaling down to only 10% at 1289 feet and beyond.

[6] Young, G.A.. 1991. Concise methods for predicting the effects of underwater explosions on marine life. Naval Surface Warfare Center, Dahlgren, Virginia.
[7] GOA-DEIS 3.6-31

The Young paper also only states short term or instant mortality. It does not evaluate intermediate and long term damage to the animals and their biological function that will kill them within days or weeks from the assault.[8]

The type of explosive is also not integrated into the metric. Rise times of explosives have a significant bearing on mortality.[9] Different explosives have varying impulse rise times[10] so without knowing what was used in the literature and what explosives are proposed in the GOA-DEIS this entire section along with the extrapolated metrics are meaningless.

The conclusion on the impacts of sonar on fish found in the DEIS on page 3.6-43 tidily sums it up: "the effects of sound on fish are largely unknown…There is a dearth of empirical information on the effects of exposure to sound, let alone sonar, for the vast majority of fish."

Given this admission (strengthened by the remaining text in the paragraph), the conclusion in table 3.6.10 "Because only a few species of fish may be able to hear the relatively higher frequencies of mid-frequency sonar, sonar used in Navy exercises would result in minimal harm to fish or EFH" contradicts the conclusion that 'we know nothing.' Either we know nothing, or we know that no harm will come from sonar exposure. Not both. Given that "we know nothing" supersedes the assumption that no harm will come from exposure, the former statement prevails.

We also do know that there are many fish that do hear well in the ranges covered by Mid-frequency and High frequency sonar[11] although currently there are no published exposure tests on these animals using MF and HF sonars. The auditory bandwidth sensitivity of these fish was probably a consequence of evolutionary pressure to hear the sounds of their main predators, the odontocetes – indicating that other odontocete prey may as well perceive and thus be impacted by Mid or High Frequency sonars.

An important element of certainty is missing from our understanding of fish responses to MF and HF sonar signals. The Popper 2008[12] report frequently cited in the DEIS refers to contract studies on the impacts of MF and HF sonars on fish, but the paper is only used to

[8] McCauley et al., High Intensity Anthropogenic Sound Damages Fish Ears, J. Acoust. Soc. Am. 113 (2003).
[9] Stocker, M "Examination and evaluation of the effects of fast rise-time signals on aquatic animals" J. Acoust. Soc. Am. 120, 3267 (2006)
[10] Fry, Donald H 1953 "Observations on the effect of black powder explosions on fish life." Calif. Fish and Game v.39:2
[11] Mann, D.A., D.M. Higgs, W.N. Tavolga, M.J. Souza, and A.N. Popper. 2001. "Ultrasound detection by clupeiform fishes." The Journal of the Acoustical Society of America 109: 3048-3054.
[12] Popper, A.N. 2008. Effects of Mid- and High-Frequency Sonars on Fish. Naval Undersea Warfare Center Division. Newport, Rhode Island. Contract N66604-07M-6056

cite known and published data about fish hearing. The impact data is not cited and the paper is a US Navy contract paper and has not been published in peer reviewed journals.

So what we are left with is data derived from audiograms taken of marine animals are a comparison of frequency and amplitude sensitivities using sinusoidal derived signals.[13] It is possible that in lieu of pitch and level perceptions, that many fish (or other marine animals) could be sensitive to other characteristics of acoustical energy; that in place of level or time-of arrival differences between sound receptors, these animals can distinguish phase differences between 'particle' and 'pressure gradient' acoustical energy. In this context, time-domain cues across these physical characteristics of acoustical energy are much more important than frequency or amplitude cues.

While this statement doesn't answer many questions in regard to the impacts of the noise generated by the proposed GOA training range operations on various fish exposed to the noises of the operations, it highlights the fact along with the "dearth of empirical information on the effects of exposure to sound, let alone sonar,"[14] that fish will be exposed to signals for which we have even less data and will include signals with fast rise times and high "crest factors"[15] which are significantly different from sinusoidal signals.

This shortcoming can only be addressed by doing systematic testing on various fish using signals and levels that more closely match the signals currently being used or developed for modern ASW operations, especially the mid frequency communication sonars that overlap the known audiological response of the subject fish and contain either rich harmonic content, fast rise times, and crest factors at or above unity.

Using the actual sonar signals to determine acoustical thresholds would also clarify the impacts of the proposed signals on other marine biota, where again the preponderance of audiological or physiological impact data are taken from sinusoidal or 'pink noise' sources. Marine invertebrates have mechanoreceptors that are adapted to the sinusoidal motions of their environment. Sometimes these motions are relatively energetic (such as the acoustical energy generated by heavy currents and wave motions), so these animals may not be as affected by extreme sinusoidal energy. On the other hand, fast rise times or high crest factors used in some acoustical communication signals may exceed the acoustical compliance of the organism and damage it. These types of signals need to be

[13] Most audiograms either use single frequency sinusoid signals or band limited "Pink Noise" which is typically derived from Fourier Transfer derived Gaussian noise constructed from sine waves without any coherent time-domain component. These signals are very unlike mid-frequency sonar signals.
[14] GOA-DEIS 3.6-43
[15] Crest factor is the ration of peak to RMS value of a signal. Pure sinusoidal waves have a crest factor of .707; pure "square waves have a crest factor of 1; repetitive impulse sounds have a crest factor greater than 1.

explored with various marine invertebrates and plankton prior to concluding that they are not impacted by loud, fast rise-time, high crest-factor sonar signals.

But in the absence of evidence clearly indicating harm, the GOA-DEIS takes the "let's see if anything floats up to the surface" approach – which has left our ocean in such bad shape already.

Acoustic Impacts: Marine Mammals

While the modeling of the impacts of acoustical exposure in section 3.8.7.2 "Acoustic Effects: Assessing Marine Mammal Responses to Sound" is extensive, detailed, and comprehensive, given the other quirky statistical models found throughout the entire GOS-DEIS (and the predictable history of biased mathematical and statistical models in prior Navy DEIS documents), frankly I worry when the Navy's statistical modelers are given so much text space to synthesize decades of scientific study into their own home-spun complex risk-continuum.

Symptoms of this are ambiguously presented in the opening gambit on Table 3.8-1[16] wherein the density of given species of concern are presented in a density metric of animals per km^2. While I understand the statistical value of having a distribution number that represents the probability of interactions within a prescribed data set, the fact of the matter is that there is no such thing as ".0019" of a Humpback whale, or even a ".1892 of a Dall's porpoise." And once the statistical arguments get to this point they are in their third derivation which indicates that they are being set up for a statistical model of convenience.

While we did review the models that use these metrics in Appendix D and at face value they appear to be based on reasonable assumptions, given some of the other biased and quirky models used in the Fish Impacts section we would need to run these models in a few scenarios to assure that they do yield cogent and credible results. For example the setting the cutoff extent of the integral to 120dB seems to be based on either excluding the harbor porpoise form the marine mammal response data set or modifying the harbor porpoise risk function to a "heaviside step function"[17] smells suspiciously like manipulations of statistical convenience.

Unfortunately given the truncated comment period on the GOA-DEIS due to the issuance of this over the traditional winter holidays we did not have as much time as would be required to review the entire architecture of the US Navy statistical arguments justifying their particular models. Suffice it to say that in addition to the forgoing comments, we suspect that there are clever manipulations afoot.

Of course none of these characterizations require a response under NEPA, but the following criticisms substantiate these claims.

[16] GOA-DEIS section 3.8-2 through 4.
[17] GOA-DEIS Appendix D-31, also Section 3.8-101

There are many questionable assumptions made in the GOA-DEIS regarding the actual levels of Temporary Threshold Shift (TTS) and Permanent Threshold Shift (PTS) in marine mammals. As inferred in the DEIS, PTS levels are on marine mammals are derived numerically and not actually known. This is because we have not intentionally subjected marine mammals to PTS levels (for compassionate reasons). I will review the PTS assumptions below, but the foundation of the PTS assumptions used in the DEIS are made from data derived from TTS studies. Furthermore, these studies have all been done on test-habituated animals, and in many cases these animals are quite old. Additionally, these studies include a level of assumptions that belie the actual data. For example a study featured in the GOA-DEIS by Finneran, Carder et al. (JASA 2005)[18] used mature (18-20 years) or old (38 – 40 years) animals that have been systematically exposed to noise studies for many years. The subjects have lived in a busy environment full of anthropogenic noise, so it is highly likely that they have been habituated to the test environment. It is clear that these animals do not represent different species of wild marine animals across a broader – and mostly younger – age range, in their own environment.

Model inaccuracies due to habituation in the instance of this study is compounded by the fact that the test animals may employ biological protections to prepare them for their tests – protections akin to the "wincing" that visual animals use to protect their eyes from damage. Terrestrial animals have a mechanism, like "wincing" in their middle ears that protect them from damaging sounds. This mechanism is a tightening of the tensor tympani muscles around the middle ear ossicles, protecting the hearing organ from physical damage.[19] While this mechanism is fast acting in response to "surprise" stimulus, once terrestrial animals are habituated to expect loud noise, the system is activated by the expectation. In humans the mechanism kicks in when noise levels reach 75dB SL (re: 20μPa) – about 10dB SL below where OSHA guidelines for TTS-level noise exposures occur in humans, and about 50dB SL below where PTS occurs.

The middle ear structure of marine mammals differs significantly from the middle ears of terrestrial animals. We are just learning about how environmental sounds are conveyed into the odontocete's inner ears. This mechanism seems to include the lipid channels in their lower jaws,[20] and the mobility of the bulla (the bone envelope that houses the

[18] James Finneran, Donald Carder, Carolyn Schlundt, Sam Ridgeway "Temporary threshold shift in bottlenose dolphins (*Tursiops Truncatus*) exposed to mid frequency tones." October 2005 J. Acoust. Soc. Am. 118(4) p.2696

[19] Pierre Buser and Michel Imbert "Audition" 1992. MIT Press. p. 110 - 112.

[20] Heather Koopman, Suzanne Budge, Darlene Ketten, Sara Iverson "The Influence of Phylogeny, Ontogeny and Topography on the Lipid Composition of the Mandibular Fats of Toothed Whales:

cochlea and semicircular canals). While this mechanism does include the same middle ear ossicles of terrestrial mammals, these bones in cetaceans can be rigidly attached to each other and connected differently (by way of ligaments) to the tympanic membrane.[21] While the ears of the odontocetes or mysticetes do not have the same tensor tympani found in terrestrial mammals, it is probable that these hearing specialist animals would have an analogous system to protect their inner ears from periodic or occasional sound levels that would otherwise damage their organs of hearing.[22] If this assumption is correct, then the "sound test" habituated dolphins would obviously yield much higher thresholds for TTS than their wild, un-habituated counterparts – given that they will always "prepare" for acoustical assaults when asked to perform in a given testing situation.

But even assuming that the legacy of TTS testing done on these test-habituated animals does accurately reflect the TTS levels for all wild, un-habituated animals, the data used to establish an "appropriate" TTS levels all show onset of TTS occurring between 185dB and 190dB (re: 1μPa^2-s).

In the DEIS these levels are presented on a chart that includes three different signal types;[23] impulsive signals representing distant explosions,[24] seismic airguns,[25] and tone bursts.[26]

This disparity in signal types is noted in the text, but with the exception of two cases of TTS as a consequence of seismic signals (one at 185dB re: 1μPa^2-s and the other at 190dB) the chart represents TTS as a consequence of pure tone bursts. (It was in this Schlunt et.al. study that the test-habituated beluga whale subject attacked the testing

Implications for Hearing" 2003 Paper delivered at the Environmental Consequences of Underwater Sound conference, May 2003.

[21] G.N. Solntseva, "The auditory organ of mammals"1995 p. 455 in "Sensory Systems of Aquatic Mammals' R.A. Kastelein, J.A. Thomas and P.E. Nachtigall eds. De Spil press.

[22] This system might involve thermo-regulating the viscosity, and thus the acoustical compliance of the lipids through regulating blood circulation around the organs -- thereby attenuating or accentuating acoustical transfer through the organ as needed.

[23] Not from Nachtigall et. Al. 2004 as stated in the DEIS. Additionally Chart 3.8.7 is mislabels "Existing TTS Data for Cetaceans when is should be labeled "Some TTS Data for Cetaceans." Many other peer reviewed TTS models exists that are not represented in the chart.

[24] Finneran, J.J., C.E. Schlundt, D.A. Carder, J.A. Clark, J.A. Young, J.B. Gaspin, and S.H. Ridgway. 2000. Auditory and behavioral responses of bottlenose dolphins (Tursiops truncatus) and a beluga whale (Delphinapterus leucas) to impulsive sounds resembling distant signatures of underwater explosions. Journal of the Acoustical Society of America. 108:417-431.

[25] Finneran, J.J., R. Dear, D.A. Carder, and S.H. Ridgway. 2002. Temporary shift in masked hearing thresholds in odontocetes after exposure to single underwater impulses from a seismic watergun. Journal of the Acoustical Society of America. 111:2929-2940.

[26] Schlundt, C.E., J.J. Finneran, D.A. Carder, and S.H. Ridgway. 2000. Temporary shift in masked hearing thresholds of bottlenose dolphins, Tursiops truncatus, and white whales, Delphinapterous leucas, after exposure to intense tones. Journal of the Acoustical Society of America. 107:3496-3508.

apparatus before the tests were complete). You might say that this illustrates that there is a physiological as well as a behavioral difference in impacts between the various signals rather than the conclusion that there is a clear threshold at 195dB as indicated in the DEIS.

Nonetheless the chart takes a "statistical mean" to justify raising the TTS level to 195dB.[27] This elevated level is justified in part by the statement: "Use of the minimum value would overestimate the amount of incidental harassment because many animals counted would not have experienced onset TTS."[28] This highlights one of my concerns; why do harassed animals need to experience onset of TTS? While it may be important to find the absolute value for onset of TTS in our model animal, the purpose here is to avoid harassing animals, not derive "statistical precision" on the exposure levels that will always produce TTS in test-habituated animals. For this reason the data should be used as found and as presented; that onset of TTS occurs in test-habituated animals at 185dB (re: $1\mu Pa^2$-s).

The statement in the DEIS that "The growth and recovery of TTS are analogous to those in land mammals. This means that, as in land mammals, cetacean [TTS] depend on the amplitude, duration, frequency content, and temporal pattern of the sound exposure"[29] is correct, but the DEIS-adapted assumptions used in the following bullet points in this section to build the argument omit the critical characteristics of "frequency content, and temporal pattern," ignoring the evidence that signal characteristics have a stronger bearing on TTS thresholds than amplitude.[30]

So the fundamental argument here is that as in the fish studies, none of the tests performed on marine mammals used to substantiate the Navy's impact and mitigation models used signals that simulated the actual sonar signals proposed in the GOA ASW activities.

Most papers cited for the DEIS used either sinusoidal tones or impulse noises. These signals do not elicit the same behavioral responses as more complex signals.[31] The test subjects of most papers cited for the DEIS were also older (over 30 years old), test-habituated animals that have been in captivity and used as test subjects for a large portion

[27] GOA-DEIS Section 3.8-87
[28] GOA-DEIS Section 3.8-92
[29] GOA-DEIS Section 3.8-87
[30] Roger P. Hamernik and Wei Qiu "Energy-independent factors influencing noise-induced hearing loss in the chinchilla model" J. Acoust. Soc. Am. 110 (6), December 2001
[31] R.A. Kastelien, D. Goodson, L. Lein, and D. de Haan. "The effects of acoustic alarms on Harbor Porpoise (*Phocena phocena*)" 1997 P.367-383 in A.J. Read, P.R. Wiepkema, and P.E. Nachigall eds. "The Biology of Harbor Porpoise" de Spil publishers, Woerned, The Netherlands.

of their lives.[32] The captive animals are accustomed to coming into a test area for their livelihood and while they provide TTS data for their specific physiology, they are poor stand-ins for a majority of marine mammals that will be impacted by the GOA proposal.

In terms of the range of impact relative to signal amplitude, Kastelein and Rippe studied younger animals (harbor porpoise *Phocena phocena*) [33] with more appropriate test signals yielded significantly different results than the assumptions made in the GOA-DEIS. These animals demonstrated an aversion to more complex signals in the frequency range of the proposed sonars and at 130dB re: 1µPa@1m. (Animals used in this study were recently taken into captivity and approximately 3 years old.)

While the signals used in this study were specifically designed to repel net-predatory marine mammals, the signals are closer in form to many communication sonars than to the sinusoidal waves or band limited pink noise used in the DEIS citations. Another study by Verboom and Kastelein indicates that more complex signals induce a discomfort threshold level for younger, less habituated marine mammals (*P. phocena* and harbor seal *Phoca vitulina*) at or below 133dB re:1µPa@1m.[34] This study extrapolates a TTS level for these animals at 150 dB(*w*) re:1µPa@1m for the harbor seal, and 137dB(*w*) re:1µPa@1m for the harbor porpoise. The paper also goes on to suggest that hearing injury – PTS, will occur in the Harbor seal and Harbor porpoise at 190dB and 180dB respectively – 50% to 500% less energy than the 195dB level that the GOA-DEIS presents as the thresholds for MMPA Level B harassment.

Like the estimated PTS levels used in the DEIS, the TTS figures from the Verboom and Kastelein (2005) study are extrapolations – extrapolating from behavioral responses to noise exposure of young, healthy marine mammals against known human auditory responses. The disparity between the TTS figures used by Verboom and Kastelein and the numbers used in the DEIS indicate a high degree of scientific uncertainty in the models and extrapolation methods used in both sets of assumptions. I am more inclined to accept the Verboom Kastelein numbers for three reasons: 1) they were not cited or crafted under the rubric of justifying a proposed program; 2) their studies were not funded by an agency whose desired actions would be limited by more precautionary

[32] e.g. J. J. Finneran, C. E. Schlundt, D. A. Carder, J. A. Clark, J. A. Young, J. B. Gaspin, S. H. Ridgway Auditory and behavioral responses of bottlenose dolphins (*Tursiops truncatus*) and a beluga whale (*Delphinapterus leucas*) to impulsive sounds resembling distant signatures of underwater explosions. J. Acoustical Soc. of America. V.108(1) July 2000.

[33] R.A, Kastelein, H.T. Rippe " The Effects of Acoustical Alarms on the Behavior of Harbor Porpoises (*Phocena phocena*) in a floating pen" Marine Mammal Science 16(1) p. 46 – 64. January 2000

[34] W.C. Verboom and R.A. Kastelein. "Some examples of marine mammal 'discomfort thresholds' in relation to man-made noise." June 22, 2005. Proceedings from the 2005 Undersea Defense Technology conference 2005, Sponsored by TNO, P.O. Box 96864, 2509 JG The Hague, The Netherlands.

results,[35] and 3) they are inherently more precautionary, in that they examine the thresholds of behavioral response, not the upper limits of physiological response.

Regarding the estimation of PTS onset relative to TTS levels used in the DEIS,[36] I find these data troubling as well. The linear regressions adapted from the W.D. Ward et al papers[37] cited in the DEIS were all taken from human subjects – highly visually adapted terrestrial mammals. Ward's research indicates a threshold of PTS by examining the maximum recoverable TTS in human and finds that humans can recover from a TTS of 50dB without permanently damaging their hearing. The Ward studies are "conservatively" tempered in the DEIS by incorporating a study of cats by Miller[38] that indicates that cat's threshold of PTS is at 40dB recoverable TTS.[39]

The cat is also a highly visually adapted terrestrial animal, though it is more dependent on aurality than humans.[40] One correlation can be deduced here is that animals that are more dependent of sound cues are less able to recover from extreme TTS. Thus if there is a 10 dB disparity in recovery levels between humans (50dB TTS) and cats (40dB TTS), it might easily follow that cetaceans who rely almost exclusively on acoustical cues would be even less likely to recover from extreme TTS and may indicate a PTS threshold at TTS level of 30dB. If we use this assumption, the onset of PTS in cetaceans may only be 15dB above the onset of TTS,[41] not the "conservative" 20dB modeled in the DEIS.

Given the forgoing, we might assume from the data presented in the DEIS that the onset of TTS occurs at 185dB re: $1\mu Pa^2$-s (as shown in the DEIS without incorporating the "statistical mean" tool), and that the onset of PTS could then be as low as 200dB re:$1\mu Pa^2$-s (taking the above assumption about recoverable TTS levels in highly

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[35] Hal Whitehead and Linda Weilgart "Science and the management of underwater noise: Information gaps and polluter power." J. Acoust. Soc. Am., Vol. 110, No. 5, Pt. 2, November 2001 142nd Meeting: Acoustical Society of America.

[36] GOA-DEIS 3.8-88–92

[37] e.g.: Ward, W.D. "Recovery from high values of temporary threshold shift." J. Acoust. Soc/ Am., 1960. Vol. 32:497–500.

[38] Miller, J.D., C.S. Watson, and W.P. Covell. 1963. "Deafening effects of noise on the cat."Acta Oto-Laryngologica Supplement Vol. 176:1–91.

[39] The DEIS states further that "A variety of terrestrial mammal data sources point toward 40 dB as a reasonable estimate of the largest amount of TS that may be induced without PTS" though no citations are provided for this statement.

[40] Ralph E. Beitel "Acoustic pursuit of invisible moving targets by cats" JASA – 1996. Vol.105(6) p.3449 This paper indicates that cats will follow acoustic cues without needing to visually identify the cue, unlike humans, who will use an auditory cue to help localize a source of noise which they will then "look for."

[41] Using the same extrapolation and linear regression found in the DEIS and using 30dB TTS as the maximum recoverable TTS level: There is a 24 dB TS difference between onset-TTS (6 dB) and onset-PTS (30 dB).The additional exposure above onset-TTS that is required to reach PTS is therefore 24 dB divided by 1.6 dB/dB, or 15dB.

acoustically-adapted animals). While these revised numbers are "lower" than the proposed thresholds of TTS and PTS (suggested for all marine mammals), they are based on assumptions that are still of questionable validity, inasmuch as they are based on extrapolated models that meld terrestrial, highly visual animals with old, test-weary odontocetes. I feel that this methodology provides a poor stand-in for a diverse variety of wild marine mammals, in their own habitat, being subjected to extreme levels of noise that they are not biologically adapted to or trained to expect.

Regarding the DEIS section 3.8-92 "Criteria and Thresholds for Level B Harassment from Non-TTS:" The authors of this section state that there is no metric to determine the "annoyance" levels of non-verbal animals. I suggest that the subjective term "annoyance" be replaced with the more observable characteristic of "disturbance." Many papers on disturbance levels in marine mammals are available[42] and can be used in lieu of trying to find published papers on the subjective "annoyance levels."

The behavioral effects section 3.8-92 does mention that "…there are few observations and no controlled measurements of behavioral disruption of cetaceans caused by sound sources with frequencies, waveforms, durations, and repetition rates comparable to those employed by the tactical sonars to be used on the proposed TMAA." This statement is the first indication in the DEIS that the authors have identified that the paucity of data derived from exposing animals to actual sonar signals is a shortcoming of the analysis.

The "risk function adapted from Feller"[43] could prove to be a useful tool, but like any model, the output is only as good as the input. As such, any data using the trained and long-term habituated animals at the San Diego test facility must be categorically dismissed because the SCC animals have been treated as "biological input devices" and thus are a very poor analogy for wild animals. Surprisingly the conclusions in the DEIS reflect exactly the opposite conclusion, although some of the shortcomings are addressed (limited species range and the animals trained for TTS tests, not behavioral tests).

The data from the Haro Strait incident[44] should be tailored to reflect that the J-pod orcas were already being set upon by groups of whale-watching tour-boats (of which they must

[42] e.g.: John R. Buck, Peter L. Tyack "An avoidance behavior model for migrating whale populations" The Journal of the Acoustical Society of America. April 2003. Volume 113, Issue 4, p. 2326 wherein gray whale avoidance threshold of 135dB re: 1μPa was established. See also W.C. Verboom and R.A. Kastelein. "Some examples of marine mammal 'discomfort thresholds' in relation to man-made noise." June 22, 2005. Proceedings from the 2005 Undersea Defense Technology conference 2005, Sponsored by TNO, P.O. Box 96864, 2509 JG The Hague, The Netherlands.

[43] GOA-DEIS 3.8-94

[44] Fromm, D. 2004. "Acoustic Modeling Results of the Haro Strait For 5 May 2003." Naval Research Laboratory Report, Office of Naval Research, 30 January 2004.

be habituated) so there is a probability that their "disturbance" thresholds would have been elevated from their non-set-upon or wild habitat state. Thus the impact risk thresholds modeled with the risk function using the Haro Strait data should be weighted down by some amount. While this is reflected in the DEIS, any weighting factor would be arbitrary.

In the absence of empirical data some model must be used. The risk function is heading in the right direction, but with the limited input sources the weighting should favor a lower threshold than what unweighted inputs from Haro Strait and SCC inputs would yield. We believe that the Nowacek data[45] is the "cleanest" of all three, but as noted in the DEIS the alerting signals do not approximate MFA Sonar signals, although the relatively low behavioral threshold for mysticetes is supported by Di Iorio and Clark[46] in seismic sparker signals.

Meanwhile excluding the fairly comprehensive and robust harbor porpoise data from the input set, or modifying the same risk function curve used in the other three inputs is arbitrary. With the paucity of data – both in terms of studies as well as species, qualified data should not be excluded from the input data set, nor should any clean data be modified to accommodate for arbitrary considerations just because the data does not fit the desired outcome of the model.

The fact is that the years of Kastelein data on harbor porpoises more accurately represent the behavioral responses of near wild animals because 1) these animals are the most recently wild captive animals, 2) the testing done on these animals is done with signals more characteristically akin to MF and HF sonar, 3) the tests are focused on behavioral responses, not operant conditioning, and 4) the testing environments have been specifically designed or cited to eliminate high levels of background noise and specular reflections found in most training enclosures.

Additionally, tailoring the harbor porpoise data because they "inhabit shallow and coastal waters suggest[ing] a very low threshold level of response for both captive and wild animals"[47] flies in the face of glomming together mysticetes and odontocetes that do fit a convenient risk function. If the justification for melting together three disparate species under three disparate conditions is due to the paucity of behavioral data available, then

[45] Nowacek, D.P., M.P. Johnson, and P.L. Tyack. 2004. North Atlantic right whales (*Eubalaena glacialis*) ignore ships but respond to alerting stimuli. Proceedings of the Royal Society of London, Part B 271:227-231.
[46] Lucia Di Iorio and Christopher W. Clark "Exposure to seismic survey alters blue whale acoustic communication" Biol. Lett. 23 February 2010 vol. 6 no. 1 51-54
[47] GOA-DEIS 3.8-101

the Tyack et. al[48] controlled exposure work on beaked whales should not have been excluded from the data set. This is particularly the case since the exposure tests were funded by the US Office of Naval Research and included beaked whales – a species of particular concern. Perhaps the Tyack results were not included because they showed behavioral responses to signal Receive Levels as low as 117 dB (re: 1 μPa)?

In section 3.8-106, Table 3.8-7a "Approximate Distance to Effects for At-Sea Explosives in the Temporary Maritime Activities Area" the metric is not stated. Are these feet or meters? Without this data the table is meaningless.

Regarding the general topic of behavioral responses to explosions, it is extremely reductionist to assume that agonistic response linearly correlates to exposure level regardless of the signal source or characteristic. The DEIS assumes that the response value of an explosion is equivalent to the response value of other impulsive but natural sounds such as thunder or calving icebergs. I don't believe that it would be too anthropomorphic to assume the analogy to human response to explosions; and that our response to explosions in our own neighborhood, or even across town would definitely be different than our response to thunder.

The clear fact is that explosions from military ordnance have the acoustical signature of things being destroyed. Regardless of the collateral damage to animals and habitat, military explosions are a product of destruction. This plays into physiological impacts and behavioral responses, but also into psychological disruption, inducing stress and anxiety, compromising biological function. The DEIS fails to bring this into the discussion.

Additionally, despite the appearances presented in the inverted impact model used to examine the impacts of explosions on fish (evaluated in this document), explosions will cause fish mortality and habitat destruction which will in turn compromise food abundance for marine mammals. To what extent is not included in the DEIS analysis.

For the foregoing reasons we advise the "No Action Alternative" be used.

In the event that the US Navy sees to dismiss the foregoing arguments, or accommodates them to their best "practicable manner" and proceeds with Action Alternative 1 or Action Alternative 2, we advise the deployment of third-party (non military) aerial and marine observers to scan coastlines and littoral waters for marine mammal stranding incidents

[48] Tyack, P. et. al.. "Effects of sound on the behavior of toothed whales." J. Acoust. Soc. Am. Volume 123, Issue 5, pp. 2984-2984 (May 2008)

during the exercises. The GOA is sparsely populated with very long stretches of uninhabited coastline. Should some catastrophic impacts of the TMAA operations kill or maim marine mammals causing them to strand there is a high probability that the event would go unnoticed or unreported without an active, non-biased watch.

Sincerely,



Michael Stocker
Director

I.1.31 SUSAN PAYNE

Naval Facilities Engineering Command Northwest
Attn: Mrs. Amy Burt, Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

January 21, 2010

Dear Commander of the Navy and Ms. Burt,

Your Gulf of Alaska DEIS does not offer the NO Action option and does not provide any alternatives other than more of your action using LFA, which has been demonstrated to negatively impact marine life, outright death of marine mammals and the disruption of fish migration. As I have testified before, I am opposed to Navy activities that use active sonar and depleted uranium.

I propose that you change the dates of operations to more accurately reflect the conditions in which an attack on the US will likely occur, under the most severe conditions. This would be winter in the Gulf of Alaska. Your choice of summer in these proposed waters directly impacts migrating animals, many Endangered, and fishermen trying to make a living on fish such as salmon that only migrate shoreward at this time. Your assertion that you need support services leads me to conclude that this summertime mission is just a salmon and halibut charter opportunity for the Navy. You talk of realistic operations, then conduct your work in the winter.

Depleted Uranium and other toxics will enter the food chain and accumulate in the tissues of marine mammals and commercially important fish species. We have spent millions of dollars and years trying to sell the purity of our fisheries. You in your actions on some of the most productive fisheries habitat in the world will contribute to the demise of our fish quality and our markets. The cumulative effect of toxics on marine mammals will lead to deaths that cannot be quantified and attributed to your actions. How will you mitigate these impacts?

Finally, the Navy should conduct themselves under the same regulations that the general public must, the Endangered Species Act, the Marine Mammal Protection Act, and all other rules of the Land. Since your draft only allows for the continuance of these activities, then limit them to only the necessary, and locate and time them to impact the fewest.

Sincerely,
Susan Payne
Susan Payne
Kodiak, AK 99615

Ps.

Your online comment form did not allow the paste function. This is not friendly to the public wishing to comment online as it requires us to retype our entire letter.

I.1.32 ANDREA PETERSON

United States Navy

Public Hearing Comment Form

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Draft Environmental Impact Statement/
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2) Submitting your comments via the project Web site at **www.GulfofAlaskaNavyEIS.com**
3) Mailing this form to:

Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt – Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

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Name: Andrea C Peterson

Organization/Affiliation: self

Address:* 9338 Northland St.

City, State, Zip Code: Juneau, AK 99801

Comments: My concern is that you are planning this testing at the height of our Alaskan summer in the nutrient rich waters of the Gulf of Alaska. Marine Mammal numbers are at their highest then because they are drawn to these waters to feed. I also know you will not be able to guarantee there are no marine mammals in the area being tested.

Stellar sea lions and many of our whales are endangered. I'm not willing to sacrafice any of them to Naval / Airforce Testing.

Please find a spot without the rich environment,

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over →

*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

ocean life and procinity to shore. This seems to be one of the worst sights and seasons possible.

Whales are most active in Alaskan waters from mid April through October, and we always have some whales in our waters year round.

I'm not sure what the answer is, but testing under these conditions will be damaging to our environment and ocean creatures.

I.1.33 MIKE PETERSON

United States Navy

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ATTN: Mrs. Amy Burt – Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

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Name: Mike Peterson - Mike Peterson 1-20-2010

Organization/Affiliation: Self

Address:* P.O. Box 240913

City, State, Zip Code: Douglas, AK 99824

Comments: Like many in the State of Alaska, I am concerned about the effects of sonar to the sealife within the Gulf.

As a Vietnam Veteran I remain distrustful of military motives in peaceful waters.

I would advocate for a 60 day period of observation, after the exercises, to document any and all damage that may have resulted from any testing to the marine life of the Gulf - within the boundaries as set forth by the U.S. Navy for the purpose of this training.

All documented material would be turned over to State DNR, Secretary of the Interior, Dept. of Alaska Fish + Game Governors office, and local newspaper in Anchorage, Juneau, Kodiak, Seward + Dutch Harbor.

Visit www.GulfofAlaskaNavyEIS.com for project information.

*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

I.1.34 CAROLYN RAMSEY

P.O. Box 190562
Anchorage, Alaska 99519
19 October 2010

Amy Burt, Environmental Planner
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Dear Ms. Burt,

I am writing to you as a concerned citizen and resident of Anchorage, Alaska. This letter addresses a few of my concerns about the *Gulf of Alaska Navy Training Activities Draft EIS/OEIS.* I understand that the U.S. Navy has "identified the need to support and conduct current, emerging, and future training activities". I understand that the the men and women in our United States Military require such training so that they can be prepared for any and all situations that may arise. This training however needs to remain at the No Action Alternative. The other option would be for the U.S. Navy to find another location away from the vast marine and endangered species that inhabit our Alaskan waters.

As noted in the Draft EIS/OEIS Appendix F page F-18 "Animals in or near an intense noise source can die from profound injuries related to shock wave or blast effects." Alaska Department of Fish and Game has developed blasting standards that say "no person may discharge an explosive that produces or is likely to produce an instantaneous pressure change greater than 2.7 pounds per square inch in the swim bladder of a fish". Considering salmon, whales and other various marine species either are fish or rely on these fish. The risk to our Alaskan food chain is unacceptable under the Alternative 1 and Alternative 2 proposals. Alaska's economy is based in natural resources and the seafood industry is its third most important natural resource. The No Action Alternative is the only option.

As noted in the Draft EIS/OEIS Appendix F page F-18 "Acoustic exposures have been demonstrated to kill marine mammals and result in physical trauma, and injury (Ketten 2005)." Mass stranding of beaked whales and porpoise have been reported in association with the use of active sonar. The disorientation and unusual behavior patterns in whales, porpoise, and many other various marine mammals have been reported in association with the use of active sonar. With the vast marine and endangered species that inhabit the Gulf of Alaska the use of active sonar in any degree is unacceptable. The No Action Alternative is the only option.

The temperatures of the Gulf of Alaska range from approximately 40 - 50 degrees, due to these cold temperatures it will take the expended ordinances hazards material much longer to degrade and dissipate therefore placing the marine ecosystem in the Gulf of Alaska in even greater danger for an even longer period of time. Again this is another reason Alternative 1 and Alternative 2 are unacceptable. The No Action Alternative is the only option.

I suggest that the U.S. Navy continue its development of interactive computer simulation software and hardware that can be used to train its sonar technicians. This will assist in limiting the damage done to the earths marine life. Mankind has been doing irrefutable damage to our earth and the life that inhabits it for many years. The damage to the ecosystem is growing each and every day. While I understand the United States Navy needs to train its personal, the risk of further damage to Alaska's fragile marine environment must be kept at a minimum. This is why the No Action Alternative is the only acceptable option.

Respectfully



Carolyn Ramsey

I.1.35 CARL RANNEY

United States Navy

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1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

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Name: Carl L. Ranney

Organization/Affiliation: self

Address:* P.O. Box 2105

City, State, Zip Code: Cordova, AK 99574

Comments: I think that the sheling in the gulf wouldn't have any major afects on the wildlife. In fact I think that the fragments from the destroyed ship if it lands on flat sea bed will aculy previd fish habatat.

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I.1.36 KRIS RANNEY

United States Navy

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Silverdale, WA 98315-1101

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Name: Kris Ranney

Organization/Affiliation: Boyscouts

Address:* P.O. Box 2105

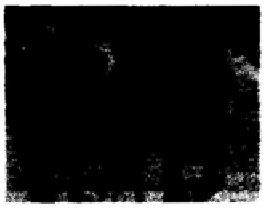
City, State, Zip Code: Cordova, AK, 99574

Comments: I was wondering if the sinking of ships in the Gulf would afect the Heilbut popukation there. As far as I know the area where you will sink ships is also home to this deep water fish species, most leave for the warmer shalow waters closer to shore in the summer but the larger fish do not come as close. Some may stay over the shelf. It takes 25 years for one of these fish to grow over 100 pounds, if you hit and killed a 600 pound fish it would take hundreds of years to replace!

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*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

I.1.37 LIBBY RIDDLES



Libby Riddles
Blazing Kennels
PO Box 15253
Fritz Creek, AK 99603
907-235-2997
lriddles@alaska.net

TO:Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt -Gulf of Alaska EIS/OEIS project Manager
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Dear Mrs Burt,

I urge you to reconsider doing especially sonar testing in the Gulf of Alaska between Prince William Sound and Kodiak and also in the Seward area.

Our ocean wildlife takes enough of a hit between the occaisional oil spills, the over-fishing, the acidification of the ocean, and other factors. Adding unreasonable risks to animals like sea lions, whales, seals, sea otters and other marine wildlife including the fish just doesn't make any sense. Sonar has been proven to be very stressful to mammals that use it for navigation especially, making them prone to beaching and other health issues we are just beginning to understand.We depend on these animals for subsistence, and also for the tourist trade, and they deserve to exist in their own right without unnessecary harassament.

Please reconsider doing your practise sessions in areas that are not so sensitive to ocean wildlife, and the people that depend on them. Explosives and sinking ships in this area seems like a really bad idea as well, for the same reasons.

Thank you for your consideration,

Libby Riddles
Iditarod Champion
Alaska Resident since 1973

I.1.38 RICHARD STEINER

United States Navy

Public Hearing Comment Form

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1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

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Name: Richard Steiner

Organization/Affiliation: Professor, University of Alaska Marine Advisory Program

Address:* 3221 E. Northern Lts. Blvd. #118

City, State, Zip Code: Anchorage, AK. 99508

Comments:

I strongly recommend that the exercises be re-located farther offshore, to minimize impact to the shelf ecosystem.

At a minimum, no potentially impactful activities should be conducted over or near the continental slope or shelf (shallower than 1000 fm or 2000 m depth). As well, all activities should be conducted only from October – February, to minimize impacts on seasonal migrant marine mammals + birds.

over please →

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I recommend that any such exercises be conducted outside of 200 n.miles from shore, and only in winter, thereby minimizing impact on seasonal resources.

As well, independent marine mammal observers need to be included to clear the safety zone which should be a large zone needs established (at least to verify no harmful exposure to noise) and no exercises should be conducted

I.1.39 STACY STUDEBAKER

Mrs. Amy Burt
Gulf of Alaska Gulf of Alaska EIS/OIES Project Manager
Naval Facility Engineering Command Northwest
1101 Tautog Circle
Silverdale, WA 98315-1101

Dear Mrs. Burt, 1/22/10

Navy Needs Better Data

The Navy visited Kodiak on Jan. 7 to brief the community on its proposed increase of training activities in the Gulf of Alaska (GOA) Temporary Maritime Activity Area (TMAA) which encompasses 42,146-square nautical miles just to the north of Kodiak Island. What least impressed me about the meeting was the Navy's arrogance and the lack of data in its presentation. I'm all for the readiness of our military, but not at the expense of vast amounts of marine life and the health of our immediate ocean environment upon which our community makes its living.

With our ocean's health and its ability to sustain life already compromised from so many other factors, the cumulative impacts, which you barely address, of these training activities in our area may cause irreparable harm to ocean life and losses to our local economy.

At the meeting the Navy discussed the 900-page Draft Environmental Impact Statement that it has been preparing for the last two years. It is now being circulated for public review. The EIS was boiled down to a few information bullets on posters stating nothing the Navy is planning to do in its exercises in the GOA would have any significant impacts on the environment! Any data upon which the Navy could make such unscientific claims were absent on the posters or in the presentation and woefully inadequate in the 900 page document.

The Navy's proposed training activities in the GOA would pose significant risk to whales, fish, and marine birds that depend on the area for breeding, feeding, navigating, and avoiding predators, in short, for their survival. Many exercises would employ mid-frequency active sonar, used to locate submarines, which has been implicated in mass injuries and mortalities of whales around the globe. The same technology is known to affect marine mammals in countless other ways, including inducing panic responses, displacing animals and disrupting crucial behavior such as foraging.

The Navy estimates its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 425,000 marine mammal "takes" (behavioral impacts, harassment, injury and death) every year. That's more than 2.125 million takes during the course of the Marine Mammal Protection Act permit it must seek from National Oceanic and Atmospheric Administration. Those numbers don't even account for the animals that die as a result of your experiments and quickly sink to the bottom. How can the Navy claim a FONSI on marine mammals when you are applying for such a permit?

In all, the Navy expects to "take" more than 20 different species of marine mammals, including seven endangered species, in the GOA. Beaked whales are barely mentioned because very little is known about them or their habitats. There may be many species of these small whales in the GOA. They dwell in deeper waters in trenches where they feed on squid and are very vulnerable to sonar because of the natural amplification and concentration of sound in marine canyons. Since they can stay underwater for up to 2 hours, it is impossible to mitigate harm to them with visual monitoring from the deck of a ship. They are among the most vulnerable and you have barely mentioned them.

The Navy's expanded training activities in the GOA also would affect fisheries and essential fish habitat, damage hard bottom habitat, and release into coastal waters a variety of hazardous materials such as spent rounds of ammunition and unexploded ordnance containing chromium, chromium compounds, depleted uranium and other hazardous materials. The report estimates an extraordinary amount of spent material will result from Preferred Alternative (Alternative 2) including a large increase in the weight of expended materials (352,000 pounds) and 10,300 pounds of hazardous material. That does not include entire ships the Navy plans to sink as part of its exercises. No data were presented on the impacts of sonar on fish and in particular, schools of salmon that swim directly through the test area.

Nearly all of the mitigation measures the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far-reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast-moving vessels by a few people standing on the deck with binoculars. Most fishermen would agree that it is impossible, even under the best conditions in the open ocean, to spot anything on the surface of the ocean.

The Navy is not planning to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife.

For example, no protection areas are proposed for harbor and Dall's porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the TMAA; for endangered humpback whales, sei and blue whales, which gather to feed in the TMAA; or for the critically endangered short-tailed albatross or North Pacific right whales, whose critical habitat is directly adjacent to the TMAA.

The Navy underestimates the number of marine mammals, fish and birds that will be harassed, injured and killed because it simply does not have the density estimates needed in order to accurately make this determination.

The National Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. Here, the Navy failed to obtain data that is essential to its analysis. In addition, there are simply no reliable estimates for current or historical abundance numbers

for many of the affected marine mammals in the GOA. How can you claim "Finding of No Significant Impact" when you don't even know what's there?

The Navy does not attempt to address the effects of sonar and contaminants on plankton, the very base of our marine food chain and only briefly addresses the cumulative impacts on the marine ecosystem.

The Navy's alternative analysis also is inadequate. The Navy only presents three options; No Action Alternative — maintaining the present levels of training without sonar, Alternative (1) — add more training with sonar, or Alternative (2) — add even more intensive training with a lot more sonar. It does not consider any other alternatives, some employed by the Navy itself in other training exercises and ranges.

Finally, and most critically, the Navy does not offer adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual monitors. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." For instance, studies show that visual monitoring only spots about 5 percent of marine mammals. Statistically, a 5 percent "success" rate clearly does not cut it.

In conclusion, there is no scientific basis for the claims you make that nothing you are proposing to do in your test area, and in our back yard, will have any significant impacts on marine life. You are coming to Alaska to test this deadly technology because you have been legally blocked from doing so in other states and your assumption is that you can get away with it here because of our small, scattered population that won't put up much of a fuss. Please don't do any more harm to our ocean and adopt the No Action Alternative.

Sincerely,
Stacy Studebaker



Stacy Studebaker is a biologist, a 30-year Kodiak resident and coordinator of The Kodiak Gray Whale Project.

I.1.40 SUZANNE TORIAN

United States Navy

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1101 Tautog Circle, Suite 203
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Name: Suzanne Torian

Organization/Affiliation:

Address:* P.O. Box 3162

City, State, Zip Code: Homer, Alaska 99603

Comments:

I am categorically opposed to the Gulf of Alaska Navy Training Activities as proposed. Please do not allow this activity to proceed.

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*Provide your mailing address to receive future notices about the Gulf of Alaska Navy Training Activities EIS/OEIS.

I.1.41 TRUSTEES FOR ALASKA

TRUSTEES FOR ALASKA

A Nonprofit Public Interest Law Firm Providing Counsel to Protect and Sustain Alaska's Environment

1026 W. 4th Ave., Suite 201 Anchorage, AK 99501 (907) 276-4244 (907) 276-7110 Fax
Email: ecolaw@trustees.org Web address: www.trustees.org

January 25, 2010

Mrs. Amy Burt
Gulf of Alaska EIS/OES Project Manager
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Suite 203
Silverdale, WA 98315-1101

Re: Comments on Gulf of Alaska Navy Training Exercises Draft Environmental Impact Statement/Overseas Environmental Impact Statement.

On behalf of the Alaska Community Action on Toxics, Alaska Marine Conservation Council, Center for Biological Diversity, Cook Inletkeeper, Kodiak Audubon Society, Kodiak Gray Whale Project, North Gulf Oceanic Society, Prince William Soundkeeper, and Turning the Tides, Trustees for Alaska submits the following comments on the Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement for proposed Gulf of Alaska Training Exercises.[1] The Navy proposes a series of training exercises in the Gulf of Alaska (GOA) and Alaska's inland training areas, collectively referred to as the Alaska Training Areas (ATA). Within the ATA, the Navy has delineated the GOA Temporary Maritime Activity Area (TMAA), a 42,146 square nautical miles (nm) zone south of Prince William Sound and east of Kodiak Island.

The purpose of the Proposed Action is to achieve and maintain fleet readiness using the ATA to support and conduct current, emerging, and future training activities. Gulf of Alaska Navy Training Exercises Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS/OEIS) at 1-2. The need for the Proposed Action is to enable the Navy to meet its statutory responsibility to organize, train, equip, and maintain combat-ready naval forces and to successfully fulfill its current and future global mission of winning wars, deterring aggression, and maintaining freedom of the seas. *Id.*

The DEIS/OEIS only considers three alternatives, including the no-action alternative. With regards to actions in the TMAA, the two action alternatives only differ in the number of exercises (with Alternative 2, the preferred alternative, including a

[1] Trustees for Alaska incorporates by reference comments submitted by other government agencies, individual scientists, environmental organizations and the public.

second 21-day training exercise in the GOA) and the addition of a sinking exercise under Alternative 2.

The Navy estimates that its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 424,620 marine mammal "takes" (behavioral impacts, harassment, injury, death) every year. DEIS/OEIS at 3.8-147. Over the course of the five year Letter of Authorization (LOA) permit, to be issued under the Marine Mammal Protection Act (MMPA), total take would exceed 2.125 million. In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the GOA.

1. The Navy's proposed exercises and the use of mid-frequency sonar pose unacceptable harm to marine mammals and the Navy has failed to fully assess available mitigative measures.

Trustees for Alaska fully supports the comprehensive comments submitted by the Natural Resources Defense Council regarding the impact of the proposed use of mid-frequency active (MFA) sonar on marine mammals in the GOA. Trustees for Alaska reiterates, briefly, the major concerns with mid-frequency sonar use in the GOA and the lacking DEIS/OEIS analysis of impacts from the training exercises in the GOA.

First, nearly all of the mitigation measures that the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far-reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast-moving vessels.

Second, the Navy has not proposed to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife. For example, no protection areas are proposed for harbor porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the TMAA; for endangered humpback whales and blue whales, which gather to feed in the TMAA; for the critically endangered North Pacific right whale, who's critical habitat is directly adjacent to the TMAA; or for any other species or habitat.

Third, the Navy's acoustics impact analysis ignores scientific studies contrary to its interests and uses methodologies not supported by the scientific community. Thus, the thresholds it sets for permanent injury, temporary injury (hearing loss) and behavioral change are invalid as a matter of science. For instance, in setting its thresholds at 195 dB for harassment and temporary injury and 215 dB for permanent injury and death, the Navy ignores a 2004 study by Nowachek et al which found that right whales respond to mid-frequency sound below 140 dB (the sound caused them to stop eating and ascend rapidly to just below the surface, making them extremely vulnerable to ship strikes).

Finally – and most critically – the Navy does not set forth adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual monitors. *See* DEIS/OEIS at 5-12. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." *Natural Resources Defense Council v. Winter*, 527 F.Supp.2d 1216, 1221-1222 (C.D.Cal. 2008). Studies indicate that visual monitoring only spots about 5% of marine mammals. Statistically, a 5% "success" rate is absolutely insufficient to be considered an effective mitigative measure. The DEIS/OEIS is also inadequate because it fails to acknowledge that the Navy has employed other more successful mitigation measures during previous training. These measures (which include some of the same mitigation measures environmental conservation organizations have supported but the Navy now claims cannot be employed) include siting exercises beyond the continental shelf and Gulf Stream, relocating exercises out of important habitat and to avoid certain species, and using a technique called "simulated geography" to avoid canyons and near-shore areas on at least three of its major ranges. The Navy has also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time. Although Chapter 5 of the DEIS/OEIS describes "alternative mitigation measures considered but eliminated," it fails to explain why these measures are not employable when they have been adopted and successfully implemented in the past. *See* DEIS/OEIS at 5-28. The Navy's claim that it cannot implement more protective mitigation measures is therefore unsupported by the DEIS/OEIS.

2. The DEIS/OEIS fails to take the requisite "hard look" at the impacts of the proposed action on endangered species and critical habitat.

Several endangered and threatened species may occur within in the TMAA including: various listed salmonids (Chinook salmon, coho salmon, chum salmon, sockeye salmon, and steelhead), various sea turtles (leatherback, loggerhead, green, and olive ridley), blue whales, fin whales, humpback whales, sei whales, sperm whales, North Pacific right whales, stellar sea lions, and short-tailed albatross. The DEIS/OEIS fails to adequately assess the impacts of the proposed action on endangered species, nor how adverse impacts will be minimized and mitigated. The DEIS/OEIS fails to provide a proper analysis of the serious impacts its sonar training and expended materials will have on the critically endangered North Pacific right whales, whose critical habitat is only 12 nautical miles from the TMAA or the endangered gray whales, which migrate through the TMAA.

3. The DEIS/OEIS fails to provide a satisfactory analysis of impacts, based on complete data.

The DEIS/OEIS underestimates the number of marine mammals (and fish) that will be harassed, injured and killed because the Navy simply does not have the density estimates needed in order to accurately make this determination. The National

Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. The simple assertion that "no information exists" does not excuse the Navy from conducting the requisite analysis to fully understand the impacts of its proposed action and make a reasoned choice amongst its alternatives. *See* 40 C.F.R. § 1502.22(a) (unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained).

The Navy failed to obtain data essential to its analysis. The Navy itself admits that it has no density estimates for endangered blue whales, North Pacific right whales, sei whales, sea turtles, California sea lion, harbor porpoise, and harbor seal.3.7-2 and 3.8-109. In addition, there are simply no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in the GOA. Despite the lack of survey/density data, the Navy simply estimates that only 1 blue whale, 1 North Pacific right whale and 4 sei whales may be harmed by its use of sonar because of the "rareness" of those whales. NEPA requires more. It requires these surveys to be completed and included in the impacts analysis.

4. The DEIS/OEIS cumulative impacts analysis fails to provide quantified and detailed information about other activities that may cumulative impact the environment, including marine mammals and fish.

The DEIS/OEIS cumulative impacts analysis is inadequate because it fails to provide the requisite quantified and detailed information about other activities and associated impacts. Table 4-1 simply lists projects that could have potential cumulative impacts with the proposed activity in the GOA without actually analyzing what those impacts will be. NEPA requires that agencies provide quantified and detailed information about past, present and reasonably foreseeable projects that support an analysis of the impacts associated with those other projects. Table 4-1 fails to provide the requisite detail or an analysis of how these other projects cumulative impact the environment.

5. The DEIS/OEIS range of alternatives is inadequate.

The Navy's range of alternatives is far too narrow in scope and has improperly failed to consider other reasonable alternatives. The Navy only considers three alternatives: the no-action alternative (maintain the status quo); increase training activities to include the use of active sonar, and; increase training activities to include the use of active sonar, conduct one additional summertime CSG exercise annually beyond that in Alternative 1, and sink up to two ships with a variety of ordnance. In other words, the DEIS/OEIS considers no action, increased training with sonar, and even more training with sonar and exercises that involve sinking vessels. The DEIS/OEIS fails to consider any other alternatives such as training measures that do not include MFA. Alternatives that include increased training with sonar and even more increased training with sonar do not amount to a "reasonable range of alternatives," as required by NEPA.

The stated purpose of the Proposed Action is to achieve and maintain fleet readiness using the ATA to support and conduct current, emerging, and future training activities. DEIS/OEIS at 1-2. The need for the Proposed Action is to enable the Navy to meet its statutory responsibility to organize, train, equip, and maintain combat-ready naval forces and to successfully fulfill its current and future global mission of winning wars, deterring aggression, and maintaining freedom of the seas. *Id.* Nothing within the purpose and need statement asserts that all action alternatives must include mid-frequency sonar use. Training exercises without the use of mid-frequency sonar could take place and still meet the purpose and need and the set of criteria used to identify whether a possible alternative meets the purpose of and need for the Proposed Action. *See* DEIS/OEIS at 2-14 to 2-14; *see also* Letter from Nova Blazej, Manager, Environmental Review Office, EPA to Tom Clements, Public Affairs Officer, Pacific Missile Range Facility, Re: FEIS/OEIS for the Hawaiian Range Complex, June 10, 2008 (EPA recommended additional alternatives be evaluated and a more precautionary approach be taken regarding the use of mid-frequency active (MFA) sonar in training exercises due to the substantial uncertainty of these impacts on marine resources). As a result, the current two action alternatives do not represent an adequate range of reasonable alternatives.

6. The DEIS/OEIS fails to take the requisite "hard look" analysis at the impacts associated with expended materials.

The Navy estimates an extraordinary amount of spent material will result from its Preferred Alternative (Alternative 2) in the GOA. The weight of expended materials under Alternative 2 would increase to 352,000 lb (160,000 kg) per year (360-percent increase over the No Action Alternative), with the largest percentage increase from expended sonobuoys. DEIS/OEIS at 3.2-34. Navy training under Alternative 2 would deposit approximately 41 lb of expended material per nm2 (5.4 kg per km2) per year over 20 percent of the TMAA. *Id.* The Navy bases its analysis on an assumption that training under Alternative 2 would remain consistent for a 20 year period. *Id.* Under this assumption, the Navy would expend approximately 3,520 tons, for a total concentration of approximately 835 lb per nm2 (110 kg per km2). *Id.* Breaking down total tons of expended material per nm in the TMAA is inappropriate because these materials are not "diluted" or spread across the entire TMAA. The Navy must identify and assess the likely levels of contaminants associated with the expended materials where those materials are to be found.

According to the DEIS/OEIS, expended bombs would account for most of the weight of expended materials, but the Navy asserts that the majority of this weight would be relatively inert material used as filler for practice bombs, such as concrete or sand. *Id.* However the DEIS/OEIS fails to provide any detail with regards to what percentage is inert.

Under Alternative 2, approximately 10,300 lb (4,680 kg) per year of hazardous material would be expended (Table 3.2-19). *Id.* The DEIS/OEIS fails to provide a full list of the amount of each hazardous material. While the DEIS/OEIS identifies elements

associated with "heavy metals," "propellants," "batteries," "explosives," and "pyrotechnics", it is unclear how much of each hazardous substance is released into the environment from the training activities. Specifically, the DEIS/OEIS identifies the following hazardous substances: lead, cadmium, mercury, chromium, zinc, copper, manganese, aromatic hydrocarbons(such as benzene, toluene, and xylene), polycyclic aromatic hydrocarbons (such as naphthalene, acenaphthene, and fluoranthene), aluminum and ammonia propellant grain, arcite propellant grain, potassium hydroxide, lithium chloride, ammonium perchlorate, plastic-bonded explosives (PBX), high-explosive (HE) components, PBX-106 explosive, PBX (AF)-108 explosive, plastic or other polymer binders, Royal Demolition Explosive (RDX, cyclotrimethylene trinitramine), High Melting Explosive (HMX, cyclotetramethylene tetranitramine), pentaerythritoltetranitrate (PETN), barium chromate, potassium perchlorate, phosphorus, titanium compounds, lead oxide, lead chromate, lead azide, fulminate of mercury, molybdenum, vanadium, columbium, sodium, and nickel. The DEIS/OEIS fails to demonstrate whether the release of these materials, in these concentrations complies with the Clean Water Act, the Ocean Dumping Act, and the London Convention.

Trustees for Alaska highlights the following materials and lacking analysis in the DEIS/OEIS as examples of the insufficient analysis of expended materials upon the marine environment.

RDX (cyclotrimethylene trinitramine), HMX (cyclotetramethylene tetranitramine) and PETN (Pentaerythritoltetranitrate) are used in bomb, missiles, blasting caps, detonation cords, etc. Most new military explosive are a mixture of RDX, HMX and plastic polymers. DEIS/OEIS at 3.3-14. However, explosives used in the training exercises (e.g. MK-82, MK-83, MK84) are older ordnances and their explosive component contain approximately 80% 2-4-6 trinitrotoluene (TNT) by mass. The toxicity of TNT in marine environments is well documented, and most studies suggest that TNT interferes with reproduction of primary producers. In high concentrations, such as those that could result from unexploded ordnances, TNT profoundly affects the reproduction capabilities of primary producers found in marine sediment. Darrar et el. "Chronic toxicity of 2,4,6-trinitrotoluene to a marine polychaete and an estuarine amphipod", Environmental Toxicology and Chemistry. August 1999. The DEIS/OEIS fails to adequately assess the potential impact of TNT and quantify possible concentrations of TNT that would be deposited in the ocean.

The DEIS/OEIS dismisses impacts associated with ammonium perchlorate on the grounds that the missiles would sink to the bottom of the ocean, where the deleterious effects would be minimized. Because of the large number of missiles being used in SINKEX (up to 28 missiles will be used), further analysis of ammonium perchlorate levels around a SINKEX area are warranted.

The DEIS/OEIS states that copper thiocynate, a component of the batteries found in sonobuoys, "would also release cyanide, a material often toxic to marine organisms, thiocynate is tightly bound, and will form a salt or bind to bottom sediments. Therefore, the risk from thiocynate is very low." DEIS/OEIS at 3.2-14. The DEIS/OEIS

insufficiently addresses the environmental impact of copper thiocynate. The DEIS/OEIS contains only two sentences that address the toxicity of thiocynate. Furthermore, the DEIS/OEIS fails to cite any research that substantiates the claim that "the risk of thiocynate is very low." While the DEIS/OEIS acknowledges that cyanide would leech from batteries containing thiocynate, it fails to provide any information about expected concentrations. This is problematic, as cyanide is extremely harmful, even in low concentrations.

Flourocarbons are a component of sonobuoys. The DEIS/OEIS assert that there will be no adverse effects. DEIS/OEIS at 3.2-32. Fluorocarbons are persistent organic pollutants (POPs), and are resistant to degradation. Therefore, bioaccumulation may occur, and at high concentrations fluorocarbons can interfere with biological processes. Fluorocarbons come in all varieties, some more reactive and harmful than others. The EIS fails to quantify the specific type of fluorocarbons present in sonobouys. While a small amount of fluorocarbons would be released, the DEIS/OEIS must consider the impact of fluorocarbons as POPs, which means they will remain in the marine environment for a long time. The DEIS/OEIS fails to take this into account.

Copper is also a component of sonobuoys. Like fluorocarbons, copper can come in a variety of forms. Depending on the type of copper compound (copper sulfide, copper oxide, etc.) it is more or less reactive. The EIS fails to give descript examples of the type of copper that is used to house sonobuoys. Copper can be harmful to primary producers, and in high concentrations bioaccumulation will yield high amounts of copper in fish and other marine organisms. Absent this information, the DEIS/OEIS findings cannot be supported.

Tungsten is found in CIWS (Close-in Weapons Systems). The DEIS/OEIS notes that exposure to tungsten through either inhalation or ingestion poses a threat to humans and other biological organisms. DEIS/OEIS at 3.2-11. Tests performed by Mitchell et. al in 2001 determined that tungsten shot ingested by ducks had "[no] deleterious health effects." *Id.* Recent studies by Strigul et. al. in 2005 suggest that even in extremely low concentrations, tungsten can have a measurable impact on terrestrial ecosystems. *See* Strigul et. al, "Effects Of Tungsten On Environmental Systems", Chemosphere, Oct. 2005. Even *extremely low* concentrations, tungsten reduced total peak biomass by as much as 8%. Tungsten primarily impacts primary producers, meaning that tungsten could potentially be toxic to algae and other single-celled organisms. The research cited is irrelevant to impacts associated with the Navy's proposed training exercises because it addresses the effect of tungsten-iron and tungsten-polymer shot in ducks. However, the type of activity the Navy would be practicing would deposit shards of tungsten and tungsten powder directly into the water column, potentially harming primary producers, not larger animals. Research suggests that primary producers are profoundly impacted when tungsten is introduced into an environment, even at low concentrations. The threat to larger animals arises from bioaccumulation, not the type of direct impact assessed by Mitchell et al. This is of special concern for the SINKEX test, which would use large amounts of tungsten rounds in a very small area, potentially yielding a very high concentration of tungsten in the water column. The DEIS/OEIS analysis of tungsten fails

to provide expected concentrations of tungsten in the waters surrounding training exercises such as the SINKEX. The DEIS/OEIS analysis is also wholly inadequate because it fails to address impacts to primary producers and the indirect impacts to the food chain.

Finally, with regard to specific assessment of hazardous materials, the SINKEX analysis is inadequate for several reasons. Alternative 2 would include two SINKEX training activities. DEIS/OEIS at 3.2-34. This training activity would result in 67,800 lbs of expended material annually. While Table 3.2-23 identifies the types of ordnance used, the DEIS/OEIS fails to quantify the amount of each hazardous waste deposited in the water column. The DEIS/OEIS acknowledges that an area of hazardous materials of relatively high concentration would be created in a SINKEX, however they fail to define what those concentrations are and fail to provide any supportive analysis for the conclusion that there will be "no measurable impact on the environment." Although the DEIS/OEIS acknowledges that the 67,800 lbs of expended material would likely be concentrated within an 8 nm^2 (DEIS/OEIS at 3.2-33) it provides no meaningful assessment of the actual impact to the marine environment in the vicinity of the SINKEX training exercise. As a result, all DEIS/OIES conclusions regarding the SINKEX activity are unsupportable.

The DEIS/OIES also generally diminishes the impacts associated with expended materials by stating that "[a]ssuming deposition of expended materials on 20 percent of the TMAA, the increase in density of deposited hazardous materials would be approximately 1.2 lb per nm2 (0.2 kg per km2) per year." DEIS/OEIS at 3.2-34. The DEIS/OEIS does not explain where the 20 percent assumption comes from. Furthermore, as noted above, averaging out lbs/nm fails to provide a proper assessment of the impact from expended materials.

Concerns over expended materials from Navy training exercises elsewhere in the United States have also drawn significant criticism from the EPA. For example, in comments submitted by EPA over the Final EIS/OEIS for the Navy's Proposed Training at the Jacksonville Range Complex in North Carolina, EPA noted that the deposition of expended materials and their accumulation over time was identified as the greatest impact of Navy training activities. April 20, 2009 Letter from Heinz Mueller, Chief NEPA Program Officer, EPA to Kelly Proctor, JAX EIS/OEIS PM; *see also* Oct. 27, 2008 Letter from Heinz Mueller, Chief NEPA Program Officer, EPA to Susan Admire, Naval Facilities Engineering Command, Atlantic Division Re: DEIS/OEIS for the Navy's Proposed Training at the Cherry Point Range Complex in North Carolina. The EPA raised concerns about the direct and cumulative long-term impacts to the aquatic environment associated with the accumulation of these expended materials. *Id.*

The DEIS/OEIS fails to fully identify, discuss and analyze the direct, indirect and cumulative short-term and long-term impacts associated with discarded debris, toxins and hazardous materials. Because the DEIS/OEIS fails to properly assess concentrations of expended materials, including hazardous materials, its subsequent analyses with respect to impacts on marine mammals, fish, marine organisms, etc. is invalid. Additionally, the

N: DEIS/OEIS analysis is lacking with regards to the impacts all expended material may have upon marine organisms and the aquatic food chain into the future.

If you have any questions about these comments, please do not hesitate to contact me at 276-4244 x 107. Thank you.

Sincerely,

Brian Litmans
Staff Attorney

I.1.42 UNITED STATES DEPARTMENT OF THE INTERIOR

United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
1689 C Street, Room 119
Anchorage, Alaska 99501-5126

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PEP/ANC

January 25, 2010

Naval Facilities Engineering Command Northwest
ATTN: Mrs. Amy Burt
Gulf of Alaska EIS/OEIS Project Manager
1101 Tautog Circle, Suite 203
Silverdale WA 98315-1101

Dear Mrs. Burt:

The U.S. Department of the Interior has reviewed the December 2009 Draft Environmental Impact Statement for the Gulf of Alaska Navy Training Activities. We have no comments to offer at this time.

Thank you for the opportunity to comment. If you have questions, you may contact me at 907-271-5011.

Sincerely,

Pamela Bergmann

Pamela Bergmann
Regional Environmental Officer – Alaska

I.1.43 LYNN WILBUR

Written comment to the United States Navy's Draft Environmental Impact Statement
For the Gulf of Alaska's Northern Edge Temporary Military Activities Area
Author: Lynn Wilbur, Sitka, Alaska

To: Mrs. Amy Burt
Gulf of Alaska EIS/OES Project Manager
Naval Facilities Engineering Command Northwest
1101 Tautog Circle, Ste. 203
Silverdale, WA 98315-1101

24 January, 2010

The following bulleted notes are highlights of my opposition to the United States Navy's proposal to increase training activities, introduce new training platforms, and introduce the use of mid frequency active sonar as outlined in Alternative 2, the preferred alternative in the Draft Environmental Impact Statement for the Northern Edge Training Range in the Gulf of Alaska. While I am also opposed to Alternative 1, I focus on details described in Alternative 2 for the scope of this letter. I do not believe that the Navy has taken a "Hard Look" at the impacts from its proposed training platforms on the air, water, sediments, and marine life in the Gulf of Alaska in alternatives 1 and 2 as required by the National Environmental Policy Act.

- **Air quality**-Alternative 2 proposes a 123-fold increase in emissions, including greenhouse gas emissions, and it only qualifies emissions below 3000 feet. It is a well-known fact that air-borne pollutants circulate in the atmosphere and sequester in circumpolar regions. The Navy claims that no mitigation is required because "Frequent precipitation probably scavenges from the air any particulates or other pollutants that might be present" (DEIS 3.1-2)-for the Navy to assume that nature will *probably* clean the atmosphere of pollutants discharged during training exercises is neither acceptable mitigation nor responsible stewardship of the environment.

- **Expended materials**-Alternative 2 proposes to release hazardous propellants, chaff, tungsten (which is toxic to marine life), fluoride compounds, 150 x the "safe" levels of hydrogen cyanide and heavy metals from missiles, bombs, sonobuoys, unmanned aircraft, etc. into the marine environment. Propellants containing PAH, benzenes, metals, and synthetic materials including PVC plastics will be released into the water column and sediments. The proposal states that these materials will "lodge in oxygen poor sediments, corrode, or become encrusted". The Navy uses environmental impact statements from other Naval training ranges, and letters written from Navy personnel to the National Marine Fisheries Service (*e.g.* DoN 2008c) to make this assumption; the Navy also refers to its own studies in other geographical regions of the U.S. (*e.g.* Wilson *et al.* 2002). I do not see how the Navy can correlate oxygen poor environments in the Gulf of Mexico with the marine environment in the Gulf of Alaska, especially in the absence of any references to meaningful studies undertaken in the GOA. It is also disturbing that the Navy plans to increase its deployment of sonobuoys by 6000%; PVC and other plastic materials are part of the expendable materials list for sonobuoys.

  Plastic compounds and other "flotsam" from the sonobuoys will be left in the ocean as well as more than 5,000 pounds of materials expended yearly from bombing and other exercises. With plastics accumulating in the North Pacific Ocean at an increasing rate, and coupled with the harmful effects that are being seen in seabirds and in the food chain, why is the Navy proposing to add to this problem? Navy personnel on hand to answer questions at the public meeting in

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Author: Lynn Wilbur, Sitka, Alaska

Juneau were completely unaware that plastic pollution is a current and enormous threat to our oceans. Even if the amount of expended materials proposed in Alternative 2 is a fraction of the total amount of garbage in the oceans today, discarding more hazardous debris and plastics in our oceans and leaving them to accumulate on the bottom or become flotsam is not responsible stewardship.

- **Fish**-the Navy admits that the TMAA encompasses highly productive areas for demersal, pelagic, groundfish, and shellfish stocks. The DEIS references a dated publication (see p. 3.6-16) to make a case for dismissing the effects of sound and pressure on the lateral line of fish, yet a more recent review by the same author (Hastings *et al.* 2005 from p. 8-1) suggests that the effects of sound and pressure on the lateral line requires more research and cannot be dismissed. The proposal criticizes the "gray literature" (wording used in Hastings *et al.* 2005, page 4), yet relies on its own final environmental impact statements, letters, and reviews from Navy biologists to provide the basis for its stock assessments and lack of mitigation effort. Contained in Hastings *et al.* 2005 is a recommendation for guidelines and criteria for studying the effects of different sound sources on fish. There exist well-referenced, peer-reviewed studies using controls that clearly show the detrimental impact of high intensity sound on the sensory organs of various commercial fish species.

  Is the same mitigation that is used fort sea turtles and marine mammals, *i.e.* using on board spotters, adequate measures for protecting our fish in the Gulf of Alaska? Do we have to rely on fish declines in order to understand the effects of sonar and missile blasts of over 200 decibels on fish, as has happened in the Baltic Sea? Neither a lack of a clear understanding of impacts of sounds on fish before proceeding with the activities as put forth in Alternative 2, nor an adequate mitigation plan is good stewardship.

- **Marine mammals**-Beaked whales have become a case study for effects of sonar on marine mammals, which was catalyzed by the Bahamas incident in 2000. There are three species of beaked whales in the GOA mentioned in the DEIS, as well as the critically endangered north Pacific right whale and the blue whale. In the DEIS the Navy is using abundance estimates based on one 10-day survey, and generalizes results from a comprehensive and well-coordinated study of several years duration of cetacean abundance off the coasts of California, Oregon, and Washington (see Appendix E-2) in order to make abundance estimates in the GOA. It is also using depth distribution measurements against the advice of the very author that it cites (see DEIS E-12). The Navy will rely on the use of up to three onboard spotters before commencing shipboard active sonar as part of its mitigation plan; these spotters will be expected to identify and count whales by reading Navy handbooks, watching DVDs, and using a paper wheel yet the DEIS does not indicate that they will receive essential training from qualified, seasoned, and experienced marine mammal biologists. The proposal indicates that the Navy *may* use aerial spotters, *if they are participating in the activity, if it is safe for them to*

  do the survey, and if they have time. The Navy does not identify or exclude critical cetacean habitat within the TMAA and will potentially be practicing with active sonar less than 25 km

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from the north Pacific right whale critical habitat. If, in the event of an unusual marine mammal stranding and/or death (USE), there will be no immediate correlation made between the sonar activity and the USE, despite scientific evidence that high intensity active sonar is harmful to whales. This means that if the National Marine Fisheries Service investigators decide that the USE has been resolved, the active sonar exercises may resume. The NMFS cannot even commit to what degree that they will be able to investigate USEs (see DEIS 5-25) and the Navy has yet to develop monitoring, unusual stranding event, or operational/communication response plans (see DEIS 5-20:24). In the SOCAL training range, three blue whales were struck by ships in the spring of 2009, yet the Navy has yet to clarify or provide details of the event, what actions were taken, and what mitigation measures were in place at the time of the ship strikes. I find the lack of study, lack of mitigation, and lack of planning highly disturbing.

I also find it disturbing that the DEIS dismisses a recommended mitigation to avoid training in the TMAA during seasonally productive times of the year, because it must "operate at any time or place to meet their training needs pursuant to Title 10"-yet it claims that it can't train in the winter. What if the "enemy" attacks Alaska during the winter months? Why does the "any time/place" policy require that they have to train near rich and biologically productive areas, critical habitats, and marine sanctuaries, and during seasonal migrations? Other recommended mitigations the DEIS dismisses are as follows:

- **Third party observers (TPO)**-The DEIS cites security reasons and a lack of military reflexes of TPOs, and the capability of its own spotters as reasons not to allow third party observers or spotters on its vessels. However, the Navy has used NOAA observers for other training projects, and has manned its own sonar-equipped vessels (*i.e.* the *Impeccable*) with contract employees. If the Navy believes that it can provide its own spotters with the same training and skill that is required of seasoned cetacean abundance surveyors, why can't the Navy provide third party observers with response training? The DEIS goes on to contradict its claims that it can provide adequate training for its spotters by admitting that personnel are not likely to be able to differentiate cetaceans species (see DEIS 5-30)-if spotters are incapable of identifying cetaceans to species, how is the Navy supposed to implement any type of monitoring protocol, especially in the event of a marine mammal take?
- **Halting activities after an USE**-The DEIS makes the claim that training exercises in the TMAA cannot be held up by investigations of cetacean mortalities, as they take months or years. This is not so according to scientists and experts who have investigated stranding events following military sonar exercises. In fact, experts have testified that timely autopsies and tissue necropsies are critical in determining whether or not active sonar is linked to cetacean strandings and deaths. Nevertheless, timely investigations should not be a means for the Navy to deflect its responsibilities under NEPA.
- **Ramping up sonar**-"ramping up" the intensification of active sonar so that animals have a chance to flee a sonar training event is a NMFS recommended mitigation plan

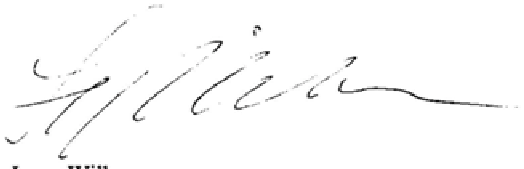
Written comment to the United States Navy's Draft Environmental Impact Statement
For the Gulf of Alaska's Northern Edge Temporary Military Activities Area
Author: Lynn Wilbur, Sitka, Alaska

(see DEIS 5-38). The Navy should be following this recommendation irrespective of their "train as they fight" policy. It seems plausible that "ramping up" can be integrated into the Navy's sonar training exercises and still allow the Navy to retain its "train as they fight" policy. The Navy must assuredly have a history of adapting and integrating other policies in their training regimes.

- **Enlargement of powerdown/shutdown zones**-Cetacean survey experts say that it is difficult, if not impossible, to spot cetaceans or identify them to species at distances greater than 1000 yards or in anything higher than a calm sea state of Beaufort 0-1. In the absence of proper mitigation measures, such as identifying and avoiding critical habitat, avoiding seasonal migration routes, and employing more sophisticated methods of identifying marine mammals in the vicinity of an active sonar exercise, the Navy should respect the recommended 2000-yard buffer zone.

- **Implementing vessel speed reduction**-Ship strikes are an increasing cause of cetacean deaths. The Navy must evaluate and reduce the speed of its vessels, especially following active sonar exercises in order to ensure the safety and protection of marine mammals and to ensure its mission of good environmental stewardship.

- **Adopting mitigation measures of foreign Navies**-NATO members have taken the negative impact of active sonar on cetaceans very seriously, and NATO and the European Union have implemented treaties, exclusion zones, and restrictions on the use of sonar during military training exercises. Protecting marine life must be a priority for the US Navy if it wishes to be respected to by its allies and consider itself a world leader in good environmental stewardship.



Lynn Wilbur
Sitka, Alaska

4

I.2 WRITTEN COMMENTS AND RESPONSE TABLE

ID	Organization	Public Comment (Written)	Navy Response
Alaska Dept of Environmental Conservation		Dear Mr. McNair: The Alaska Department of Environmental Conservation has reviewed the information in the subject letter and the referenced websites regarding United States Navy training intentions within the described temporary Maritime Exercise Area in the Gulf of Alaska. It has been determined that the temporary Maritime Training Area is not within Alaska State waters. Therefore, there is no regulatory jurisdiction within the proposed training area under the provisions of Title 18, Alaska Administrative Code, Chapter 75, Oil and Other Hazardous Substances Pollution Control. Thank you for inquiry with the Alaska Department of Environmental Conservation. If you have any questions regarding this correspondence please contact Martin Farris or John Kotula. Sincerely, Betty Schorr, Program Manager	This comment is duly noted.
Alaska Dept of Military and Veterans Affairs - 1		Dear Mrs. Burt: As the Commissioner of Alaska's Department of Military and Veterans Affairs, I can assure you that the Parnell Administration fully support "Alternative 2" proposed by the U.S. Navy in its Draft "Gulf of Alaska Navy Training Activities Environmental Impact Statement / Overseas Environmental Impact Statement" (EIS/OEIS). This Administration supports the "increase training activities to include the use of active sonar, accommodate force structure changes to conclude new platforms, weapons systems, and training enhancement instrumentation, and conduct one additional summertime CSG exercise annually."1 The Parnell Administration's support of alternative 2 is steadfast give that the U.S. Navy has an excellent track record in caring for Alaska's land, sea, and air. As you realize, the Gulf of Alaska is very important to the people of our state who rely on this area for their livelihood and subsistence needs. These areas are home to a vast array of marine mammals and the largest and most diverse fisheries in the United States. We understand that protecting the marine environment of the Gulf of Alaska is an important goal of the Navy. We appreciate the Navy following detailed programs to care for the environment and realize that the Navy continues to improve these programs as they learn more about the ocean and marine species.	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
Alaska Marine Conservation Council (AMCC) - 1		Re: *Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities* The Alaska Marine Conservation Council (AMCC) is a community-based organization dedicated to protecting the integrity of Alaska's marine ecosystems. Please accept these comments on behalf of our board and members who include commercial and sport fishermen, subsistence harvesters, and coastal residents throughout Alaska. These individuals and their families are culturally and economically dependent on a healthy marine and coastal environment. AMCC submits these comments in addition to verbal testimony provided at the hearing on the Draft EIS in Kodiak, Alaska on January 7, 2010.	Thank you for taking part in the public review process and attending our Kodiak public hearing.
AMCC - 2		After review of the Draft EIS, AMCC remains concerned about the proposed increase in Navy training activities in the Gulf of Alaska (GOA). Particularly of concern are the effects of underwater noise on living marine resources, especially noise resulting from the use of sonar in this productive and important marine environment.	The Navy shares your concern for marine resources and is presenting this FEIS/OEIS along with NMFS as a cooperating agency in the process. The Navy is a leader in funding research to better understand marine species so that training activities can be conducted with the least possible impacts. The biological sections of Chapter 3 of the EIS/OEIS (Sections 3.5-3.9) provide the details of the Navy's analysis and demonstrate that there is little relative risk to living marine resources from sonar use or other training exercises as proposed in the Final EIS/OEIS.
AMCC - 3		AMCC supports the no action alternative which would maintain current training activities and does not involve the use of sonar.	This comment is duly noted. As explained in Section 1.4 of the Draft and Final EIS/OEIS, the decision on which alternative the Navy will pursue will be made in light of the Purpose and Need by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
AMCC - 4		The alternatives listed in the analysis are inadequate to explore a range of options for increased training potential without the use of sonar, and thereby reduce options for consideration only to the no action alternative.	For EISs that propose a new tempo of current training, the No Action Alternative is seen as the current management level of asset usage or, in this case, status-quo as the current level of training area usage. The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027). Alternatives 1 and 2 discuss the increase from these levels and include the use of sonar. This is the approach properly taken in developing alternatives for this EIS (See #3 of CEQ's Forty Most Asked Questions). The Navy has explored a range of alternatives as discussed in the FEIS, Section 2.3.1, Alternatives Development. This

ID	Organization	Public Comment (Written)	Navy Response
			includes a discussion of the Navy's alternative selection criteria that was used to determine the potential range of alternatives based on the purpose and need of the Proposed Action. Based on the criteria presented in the FEIS, the Navy evaluated all alternatives that were considered but eliminated from further consideration and identified the No Action Alternative and two other action alternatives to be carried forward and analyzed in detail in the FEIS. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
AMCC - 5		Overall, the proposed action would result in dramatic changes in the acoustic marine environment inside and adjacent to the operating area that could have significant impacts on fish and marine mammals inhabiting these waters.	Chapter 3, Sections 3.6 (Fish) and 3.8 (Marine Mammals) of the EIS/OEIS provide the details of Navy's analysis and demonstrates there is little risk to living marine resources in the Gulf of Alaska from sonar use or other training exercises as proposed in the EIS/OEIS.
AMCC - 6		Designated critical habitat for the North Pacific right whale, the world's most endangered whale, is located directly adjacent to the training area, a mere 12 miles away. This is a major concern given that this population is literally teetering on the brink of extinction. Waters in the Gulf of Alaska provide vital feeding habitat particularly suited to the right whale's biological needs. Underwater noise related to the proposed Navy training activities could drive the right whales away from these feeding grounds, potentially resulting in major impacts to the North Pacific right whale population and species.	As presented in Section 3.8 and shown on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest border of the TMAA. Most of the activities proposed will take place far from the TMAA borders because requirements of training realism place ASW activities towards the center of the TMAA for a 360 degree training experience. Therefore, activities with potential impact to North Pacific right whale Critical Habitat would be much further than shown on Figure 3.8-1.
AMCC - 7		In response to measures to mitigate impacts on marine mammals with use of on board visual monitors in the form of personnel with binoculars as the primary means to reduce impact, we believe these measures to be inadequate. The proposed measures rely on observations to enact the 1,000 yard power down and the 200 yard shut down. Fishermen can share endless stories about looking for gear in this area. Boats can spend hours and even days searching for a flag and buoy they know is there, with the benefit of locating coordinates, before spotting the gear. Studies show that visual monitoring only spots about 5% of marine mammals.	Chapter 5 presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events at sea in the TMAA. As detailed in that section, the mitigation measures involve much more than a sonar "safety zone", a (1,000 yard power down and 200 yard shutdown) and make use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. Please note that such measures have been approved by NMFS in other EISs. The mitigation measures presented were developed in coordination with NMFS biologists and scientists to determine which mitigation measures would be both effective and still allow the

ID	Organization	Public Comment (Written)	Navy Response
			Navy to meet its operational needs for realistic training. Please note that the comment referencing studies indicating "a 5% success rate" was with regard to survey protocols, were not done using Naval personnel or vessels (which have a higher height of eye for observation), and did not take into account the circumstances present during a training event such as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space. The Navy does not expect 100% of the animals present in the vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness, however, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. Section 5.2.1.6 from pages 5-28 through 5-41 provides detailed explanations for why some previously used or suggested measures have been eliminated from further consideration. In the first training events authorized under the Marine Mammal Protection Act, some measures were attempted in previous training events at other locations in the past (since 2006) but were subsequently shown to be clearly ineffective or having resulted in an impact to training realism. The suite of mitigation measures proposed by Navy, developed in coordination with NMFS, and presented in Chapter 5 provides the best balance between the need to be precautionary in the protection of marine mammals and the needs to realistically train at sea.
AMCC - 8		In addition, it is quite possible the Navy underestimates the number of marine mammals and fish that may be harassed,	Section 3.8.2 in the EIS/OEIS discusses the density estimates: In April 2009, the Navy funded and NMFS conducted the Gulf

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		injured or killed due to lack of density estimates needed to accurately make this determination. For many reasons, there a simply no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in this region.	of Alaska Line-Transect Survey (GOALS) to address the data needs for density analysis. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 for full discussion on the survey. CEQ regulation at 40 CFR §1502.24 requires the Navy to ensure the "professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements" and to "identify any methodologies used and make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement." Navy has met this requirement. The EIS represents the best available science and most applicable science on species and distribution. The Navy has taken a hard look through its analysis and has considered competing and contradictory scientific research. Under 40 CFR §1502.22, NEPA allows for recognizing incomplete and unavailable information. Information on species density found in Tables 3.8-1 and 3.8-2 of the EIS was compiled from NMFS Stock Assessments as well as the 2009 GOALs survey and two other vessel surveys in the GOA. Therefore, density data has been generated based on available data in coordination with technical staff from NMFS. The Navy's marine mammal density estimates take into account all of the factors cited in this comment that lead to biological abundance. These density estimates then informed the acoustic modeling analysis, the results of which can be found in Section 3.8.7.9 of the EIS/OEIS. The results in this section consider all of the marine mammal species present in the Gulf of Alaska and indicate that although as many as 425,000 animals could be exposed to sound from Navy sonar and explosives, only **one** is estimated to receive sound at levels that could cause some degree of permanent hearing loss. The remainder are non-injurious Level B exposures. No marine mammal deaths are expected as a result of the proposed training activities.
AMCC - 9		Another factor that has not been considered in the EIS is the habituation of sperm whales with commercial fishing vessels. In recent years, interactions between commercial fishing vessels prosecuting the halibut and sablefish fisheries have had increased interactions with sperm whales as the whale approach the boats looking for an easy meal. A	A discussion of cumulative effects of Navy training with commercial fishing in the Gulf of Alaska is presented in Chapter 4. With regard to sperm whales interacting with fishing vessels, anecdotal information available and discussions with folks involved in fishing in Alaska conveyed to Navy personnel that it is the sound of hydraulics reeling in a fishing line that

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		whale may seek out the sound of a boat to explore the vessel's activity, thereby further decreasing the effectiveness of proposed mitigation measures and increasing the whale's exposure to noise resulting from training activities.	attracts sperm whales to the fishing boats. Navy vessels use a system to deploy and retrieve a towed hydrophone array but do so while underway and this system is designed to be very quiet since it is used to detect submarines passively. In essence, there is no equipment on a Navy vessel that is analogous to the equipment on fishing vessels that is believed to attract sperm whales.
AMCC - 10		The Draft EIS is majorly lacking in a robust analysis of fish habitat and fishing grounds that occur in the geographic area considered for training activities, which precludes any effective analysis of the potential impacts to fish and commercial fishing activities from the proposed activities. For example, the Draft EIS does not include an adequate discussion of salmon migratory routes in the Gulf of Alaska and therefore lacks a robust analysis of impacts to migrating salmon species in the region.	As presented in Section 3.6, there will be no impacts to fish populations and no significant impacts to fish in migratory routes, such as noted on page 3.6-14 for example. In addition and as presented in Section 4.1.3.1, the impacts and influence of commercial fishing activities far overshadows any potential impacts that may result from Navy training activities. This assessment is based on the best available data, science, and research being conducted by the Navy, regulatory agencies, and other sources, and includes bathymetric data and habitat prepared by NOAA. The conclusions of the assessment are based on regulatory criteria for impact determination. Given the localized and infrequent nature of the activities, the Navy has determined that the proposed training would not have an impact on fish populations. While individual fish may be harmed if they co-occur with some activities, this would not have any impact on the overall population. Therefore the minimal effect determination does not imply that individual fish would not be affected, but based on the regulatory criteria, that impacts from the proposed activities would not constitute a population- level effect (i.e., adverse impact).
AMCC - 11		The Draft EIS is lacking a thorough analysis of the potential impacts to halibut and the halibut fishery. The document includes no discussion or maps showing the major halibut regulatory area that directly overlaps the training area nor does it discuss halibut habitat in the area- this information must be added to the Draft EIS.	The TMAA overlaps with International Pacific Halibut Commission statistical areas 240, 250, 260, 270, and a small portion of 230. A Map showing this overlap, as well as an analysis to halibut and the fishery, has been added to the FEIS/OEIS in Section 3.6.1.1 (Figure 3.6-1).
AMCC - 12		The proposed training activities area overlaps Gulf of Alaska Slope Habitat Conservation Areas that are not mentioned in the Draft EIS (see: http://www.fakr.noaa.gov/habitat/efh/goascha.pdf). The Draft EIS should include maps showing the overlap of designated EFH and other important fish habitat in the Gulf of Alaska such as the Slope Habitat Conservation Areas.	These conservation areas are discussed in Section 3.5 and depicted on a map in Figure 3.5-7 specifically for the purpose of illustrating those conservation areas that are present in the TMAA.

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AMCC - 13		Additionally, while the Draft EIS admits that "...the effects of sound on fish are largely unknown" (3.6-4.3), it concludes that the proposed activities including sonar will not adversely affect fish. AMCC advises the Navy to utilize a precautionary approach to potential impacts in data poor environments, especially when dealing with highly valuable commercial fish stocks or endangered marine mammals populations.	An assessment of impacts associated with sound (from impulsive and non-impulsive sources), as well as, explosions is presented in the Draft EIS/OEIS for the various sources expected in the GOA TMAA as a result of training activities. See Section 3.6.1.4 for discussion on hearing ranges in fish and also Sections 3.6.2.3 through 3.6.2.5 for discussion of effects of proposed actions on fishes (explosive sounds, sonar usage, etc.) This information is based on the best available science and research being conducted by the Navy, which includes some of the foremost researchers and experts on hearing in fishes. The range of acoustic effects analyzed includes no effects, small behavioral effects, significant behavioral effects, temporary loss of hearing, and physical damage. Potential effects of explosive charge detonations on fish and EFH include disruption of habitat; exposure to chemical by-products; disturbance, injury, or death from the shock (pressure) wave; acoustic impacts; and indirect effects including those on prey species and other components of the food web. The conclusions of the assessment are based on regulatory criteria for impact determination. Given the localized and infrequent nature of the activities, the Navy has determined that the proposed training would not have an impact on fish populations. While individual fish may be harmed if they co-occur with some activities, this would not have any impact on the overall population. Therefore the minimal effect determination does not imply that individual fish would not be affected, but based on the regulatory criteria, that impacts from the proposed activities would not constitute a population-level effect (i.e., adverse impact).
AMCC - 14		The Draft EIS also lacks a thorough assessment of the overlap with fishing areas, and the conclusion that there will be no socioeconomic impacts from the proposed action (including fishing) is impossible to predict without comprehensive answers to the above mentioned comments.	Because the Navy has no exclusive “right of way” when conducting training activities on the ocean, Navy ships and aircraft intentionally seek areas clear of all other vessel traffic, thereby reducing the likelihood of negatively affecting vessels engaged in fishing or other use of this ocean area.
AMCC - 15		In addition to concerns regarding effects on marine mammals and fish as a result of the use of sonar and an increase in underwater noise from training activities, AMCC is also concerned about expended, hazardous wastes expected to result from the proposed training activities. The Navy concludes in the Draft EIS, without sufficient data, that,	The Final EIS/OEIS thoroughly analyzes the impacts of expended materials used during Navy training activities. As shown in Table 3.2-18 and 3.2-19, an estimated 352,000 lb (176 tons) of material would be expended during the training activities proposed under Alternative 2, with less than 3 percent of that material (about 5 tons) considered to be

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		"In general, ordnance constituents appear to pose little risk to the marine environment (3.2-5). Again, there is no specific analysis of the benthic communities where these expended materials settle, and they may include EFH as well as Habitat Areas of Particular Concern (HAPCs), or important habitat for bottom-dwelling halibut.	hazardous. Section 3.2 of the EIS/OEIS describes the impacts from the perspective of potentially hazardous materials such as explosives constituents. Section 3.3 describes the impacts of expended materials in terms of water and sediment quality. In addition, the existing discussion on the breakdown of hazardous materials in Environmental Consequences of Section 3.2.2, Expended Materials has been reviewed and, as appropriate, expanded. The analysis in the EIS/OEIS concludes that Expended and hazardous materials under the Proposed Action would not have a substantial effect on the marine environment. Effects on marine benthic communities are analyzed in Sections 3.5.2.3, 3.5.2.4, and 3.5.2.5. The Navy completed an Essential Fish Habitat Assessment, which included analyzing effects to EFH for scallops, groundfish, salmon, and Habitat Areas of Particular Concern. A summary of that analysis has been incorporated into the FEIS/OEIS in Section 3.6.1.2. Additionally, a halibut analysis and figure (Figure 3.6-1) has been added to Section 3.6.1.1.
AMCC - 16		AMCC is dismayed that the Navy only provided the bare minimum 45-day review for the Draft EIS and did so over the holidays, leaving insufficient time for the public to review and comment on the proposed action. This lack of consideration for the public's ability to comment is unacceptable given the scope of the proposed activities. AMCC requested an extension of the Draft EIS comment period and we do so again here in our written comments.	The Navy has complied with all NEPA notification requirements under 40 C.F.R. § 1506. NEPA regulations require that agencies not allow less than 45 days for comments on a DEIS. The public review period for the Gulf of Alaska (GOA) Draft EIS/OEIS began with publication of a Notice of Availability on December 11, 2009. This notice specifically listed library repositories where the hard copy document could be viewed, and stated specifically that the document could be viewed online at the project website. In addition, specific mention of the locations where a copy of the GOA Draft EIS/OEIS could be viewed or downloaded were made in the following: - Postcards sent to potentially affected Tribes and Nations, State and Federal regulatory and government agencies, non-governmental organizations, fishing groups, and individuals - Newspaper advertisements in newspapers in Alaska - Press releases to numerous print, TV, and online media - Meeting flyers sent to community locations in Alaska. - Stakeholder letters sent to previously identified stakeholders including Tribes and Nations, Federal and State elected officials, State and Federal regulatory and government agencies, and individuals. Please note that public comments are very important to the

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			NEPA process. The Draft EIS/OEIS was released to the public for a 45-day comment period. During this 45-day period, the Navy made extensive efforts to conduct outreach based on what was learned during the scoping period and public feedback. There were ample opportunities, as well as a wide variety of options, to comment on the Gulf of Alaska Draft EIS/OEIS. The public provided comments via mail, online comments via the Gulf of Alaska EIS/OEIS website; or attendance at one of five public hearings in the state of Alaska in January 2010. At the public meetings, the public had an opportunity to publicly or privately comment in front of a court reporter or fill out a comment form, and turn it in. The Navy considered your request for an extension of the 45-day comment period. After further evaluation of the request, and the outreach efforts conducted by the Navy for the Draft EIS/OEIS, the Navy felt it was not necessary to extend the public comment period for review of the Draft EIS/OEIS.
AMCC - 17		Furthermore, new research points to the disturbing trend of ocean acidification occurring in our marine waters, with high latitude seas particularly at risk. Reduced pH levels already measured in the Gulf of Alaska pose a new and potentially significant source of stress on the food web (J. Mathis. 8/11/09. Ocean Acidification in Alaska: New findings show increased ocean acidification in Alaska waters. University of Alaska Fairbanks, School of Fisheries and Ocean Sciences. Press release. http://www.sfos.uaf.edu/oal). Alarmingly, studies have also demonstrated that noise travels farther underwater as pH reduces, creating concern for acoustic changes in the marine environment to have an even greater impact on marine species that previously thought. (Hester, et al. 2008. Unanticipated consequences of ocean acidification: A noisier ocean at lower pH. Geophysical Research Letters. Vol. 35. http://iod.ucsd.edu/courses/sio278/documents/hester et al 08 ocean noisier pH irl.pdf).	Ocean acidification is addressed under Cumulative Impacts in Section 4.2.1.2 of the FEIS/OEIS. Additionally, the proposed Navy actions for the Gulf of Alaska should have no net effect on the emission of greenhouse gases given the Navy is required to maintain trained forces and must undertake the necessary training activities at some location, if not in the proposed TMAA. The proposed action will, therefore, have no significant additive or cumulative impact on greenhouse gas emissions, global warming, or the chemistry of the ocean as a result of any of the proposed action alternatives.
AMCC - 18		The Navy must consider this research and the impacts of ocean acidification on the marine environment in the EIS, especially within the cumulative impacts section.	Ocean acidification is addressed under Cumulative Impacts in Section 4.2.1.2. of the FEIS/OEIS.

ID	Organization	Public Comment (Written)	Navy Response
AMCC - 19		In closing, we again urge the selection of the No Action Alternative. The proposed increase in Naval training activities in the Gulf of Alaska lies squarely within some of the most productive marine waters in the United States and the world.	Please see response to AMCC – 3.
AMCC - 20		The Gulf is home to a myriad of marine mammals, fish and other marine species that contribute to a rich and productive tapestry of life here.	The Navy is aware of the rich and diverse biological presence in the Gulf of Alaska and as such, has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS. Chapter 4 includes cumulative analysis of all past, present, and reasonably foreseeable future projects in or possibly affected the GOA and the Navy activities addressed in the EIS/OEIS.
AMCC - 21		Important fish habitat and fishing grounds overlap and lies adjacent to the area proposed for training, and coastal communities rimming the Gulf of Alaska continue to rely on the health of these fisheries for their economic and cultural well-being.	As detailed in Sections 3.6 and 3.12, the proposed training activities should not have an impact on populations of fish or the health of the fisheries and socioeconomics in Alaska.
AMCC - 22		Given the high stakes to the living marine resources and surrounding communities, we strongly reiterate that this is an inappropriate location for increasing Naval training exercises and introducing the use of sonar. Sincerely, Theresa Peterson, Kodiak Outreach Coordinator, Alaska Marine Conservation Council Kelly Hartell, Executive Director, Alaska Marine Conservation Council	This comment is duly noted.
Andrew Bakke		I am completely against this unnecessary program!!!	This comment is duly noted.
Basel Action Network (BAN) - 1		Ms. Amy Burt, I write on behalf of the Basel Action Network (BAC) to submit comment on the Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for proposed Gulf of Alaska (GOA) training exercises. BAN requests consideration of the comments because they present new information that was not previously available during the comment period. While the comment period for the draft EIS has closed, the comments provided in the attachment contain new information showing that the proposed GOA training exercises will affect the quality of the environment in a significant manner not addressed under the draft EIS. Therefore, BAN requests consideration of this new information in the final EIS or through a supplemental EIS. See 40 C.F.R. §1502.9(c)(1)(ii); Marsh v. Oregon Natural	This comment is duly noted. We have not been able to locate the report discussed in BAN – 2 nor is FWC aware of such a report. Therefore, the findings discussed in the EIS/OEIS are the most relevant. If you can provide us with a copy of the mentioned report we will further evaluate its findings.

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		Resources Council, 490 U.S. 360, 374 (1989). Please find comment attached. Your acknowledgment of receipt of this e-mail and its attached comment are much appreciated. Sincerely, Colby Self Basel Action Network	
Basel Action Network (BAN) - 2		RE: Comment on Gulf of Alaska Navy Training Exercises Draft Environmental Impact Statement/Overseas Environmental Impact Statement **Request for Comment Consideration** The Basel Action Network (BAN) submits these comments on the Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) for proposed Gulf of Alaska (GOA) training exercises. BAN requests consideration of the comments because they present new information that was not previously available during the comment period. The Florida Fish and Wildlife Conservation Commission released a report in May 2010, summarizing a five-year post-sinking monitoring study on PCB leaching from the sunken Ex-USS Oriskany. The study reveals PCB concentrations in fish caught at the Oriskany site at more than twice the EPA screening limits and above the Florida Department of Health's fish advisory limits. PCB sampling results are discussed below and are relevant to the environmental impacts of the Navy's SINKEX activity in the Gulf of Alaska. While the comment period for the draft EIS has closed, the comments provided below contain new information showing that the proposed GOA training exercises will affect the quality of the environment in a significant manner not addressed under the draft EIS. Therefore, BAN requests consideration of this new information in the final EIS or through a supplemental EIS. See 40 C.F.R. §1502.9(c)(1)(ii); Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 374 (1989).	Please see BAN – 1 regarding the FWC report findings.
Basel Action Network (BAN) - 3		**I. Comment: Impacts from SINKEX vessels.** The Draft EIS/OEIS acknowledges that Sinking Exercises (SINKEX) will occur in the Gulf of Alaska (GOA) Temporary Maritime Activities Area (TMAA); however, the long-term environmental impacts associated with SINKEX are not	Please see BAN – 1 regarding the FWC report findings.

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		discussed in the Draft EIS/OEIS. The Navy has in the past acknowledged the presence of hazardous materials remaining within the composition of scuttled naval vessels, including, but not limited to: polychlorinated biphenyls (PCBs), asbestos, iron, lead paint, antifouling paint containing tributyltin (TBT), and polybrominated diphenyl esters (PBDEs). Yet these materials and their effects on the environment, marine life and human health are not discussed in the Draft EIS/OEIS. We ask for additional assessment of the risks associated with the ocean disposal of these toxic materials in the GOA pursuant to the SINKEX program. The assessment should state the specific amounts of each material (mentioned above) expected to be left onboard scuttled vessels, as well as their expected impacts on the environment, marine life, and human health.	
Basel Action Network (BAN) - 4		**II. Comment: SINKEX impact assessment is based on inconclusive research.** While removal of liquid PCBs is required before a vessel is scuttled via SINKEX, the complete removal of all or most solid material containing PCBs is not. The SINKEX general permit issued under 40 CFR 229 states *"The Navy may leave in place wire cables, felt gaskets and other felt materials that are bonded in bolted flanges or mounted under heavy equipment, paints, adhesives, rubber mounts and gaskets and other objects in which the Navy has found PCBs…"* In effect, SINKEX vessels contain large quantities of PCBs which remain in the vessel during and following sinking and are thus exposed to the marine environment. Current SINKEX remediation practices were developed 11 years ago (1998-1999) and were based on the Sunken Vessel Study that assessed the impacts of a single SINKEX vessel, the Ex-USS Agerholm, 17 years after the vessel's 1982 sinking. At the time of the assessment, solid PCBs were not believed to leach into the marine environment and little was known about PCB transport in an aqueous setting. In fact, the EPA allowed SINKEX to operate solely under the General Permit (issued under the Marine Protection, Research and Sanctuaries Act) and exempt from the Toxic Substances Control Act, because there was a *"lack of evidence of unreasonable risk to human health or the environment..."* considering the type of PCB material involved (solid PCBs).1 They stated *"Solid PCBs are not*	Please see BAN – 1 regarding the FWC report findings.

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<tr><th>ID</th><th>Organization</th><th>Public Comment (Written)</th><th>Navy Response</th></tr>
<tr><td></td><td></td><td>believed to be readily leachable to the marine environment."
2 These conclusions are not supported by current scientific research. While further research is both necessary and appropriate to assess the environmental impacts of SINKEX vessels, particularly the impacts of PCBs on the environment, marine life and human health, continued reliance on out-dated research is not appropriate.</td><td></td></tr>
<tr><td>Basel Action Network (BAN) - 5</td><td></td><td>III. Comment: New study shows detrimental impacts from sunken naval vessel.
In the 11 years since this Sunken Vessel Study (Ex-USS Agerholm), new research confirms that solid PCBs leach into the marine environment, are taken up by marine organisms, and are transferred up the food chain.
The Ex-USS Oriskany was sunk as an artificial reef 23 nautical miles off the coast of Florida in 2006 and was prepared for sinking in much the same way as SINKEX vessels. All liquid PCBs were removed from the vessel prior to sinking; therefore all documented PCB leaching is from solid PCBs. 33% of all fish sampled post-sinking in the vicinity of the Oriskany had PCB concentrations above 20 parts per billion (ppb), the EPA screening level. 21% of all fish sampled post-sinking had PCB concentrations above 50 ppb, the Florida Department of Health fish advisory threshold. Total PCB concentrations in fish samples increased 1,446% on average from pre-sinking to post-sinking.
<table>
<tr><th></th><th>Pre-Sinking Oriskany Site</th><th>Post-Sinking Oriskany Site</th></tr>
<tr><td>Red Snapper Samples</td><td>17</td><td>157</td></tr>
<tr><td>Red Snapper Mean PCB Concentration</td><td>2.36 ppb</td><td>54 ppb</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Total Samples</td><td>62</td><td>180</td></tr>
<tr><td>Total Mean PCB Concentration</td><td>3.8 ppb</td><td>58.75 ppb</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Total Fish Above 20 ppb (EPA Screening Level)</td><td>2
(gag & king mackerel)</td><td>60</td></tr>
<tr><td>Total Fish Above 50 ppb (Florida DoH Fish Advisory Threshold)</td><td>1
(king mackerel)</td><td>38</td></tr>
</table></td><td>Please see BAN – 1 regarding the FWC report findings.</td></tr>
</table>

<table>
<tr><th>ID</th><th>Organization</th><th>Public Comment (Written)</th><th>Navy Response</th></tr>
<tr><td></td><td></td><td>Note: gag and king mackerel fish were not sampled post-sinking.
Source: Table developed by Author based on data provided by the Florida Fish and Wildlife Conservation Commission Post-Sinking Monitoring Study
1 Official letter from Carol Browner, EPA Administrator, to Richard Danzig, Secretary of the Navy, September 13, 1999.
2 IBID</td><td></td></tr>
<tr><td>Basel Action Network (BAN) - 6</td><td></td><td>There were also two sampling events in 2008 on a control reef; these results were also recently released in May 2010. The control reef is a concrete bridge rubble reef that is 8 miles from the Oriskany site. The control reef samples were taken on the same days as the Oriskany samples in 2008. PCB concentrations in fish caught at the Oriskany site in 2008 were more than 932%, on average, higher than PCB concentrations in fish caught at the control reef.
<table>
<tr><th></th><th>2008 Control Reef</th><th>2008 Oriskany Reef</th></tr>
<tr><td>Red Snapper Samples</td><td>45</td><td>60</td></tr>
<tr><td>Red Snapper Mean PCB Concentration</td><td>7.6 ppb</td><td>55.22 ppb</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Total Samples</td><td>61</td><td>61</td></tr>
<tr><td>Total Mean PCB Concentration</td><td>7.89 ppb</td><td>81.44 ppb</td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td>Total Fish Above 20 ppb (EPA Screening Level)</td><td>5</td><td>16</td></tr>
<tr><td>Total Fish Above 50 ppb (Florida DoH Fish Advisory Threshold)</td><td>0</td><td>12</td></tr>
</table>
Source: Table developed by Author based on data provided by the Florida Fish and Wildlife Conservation Commission Post-Sinking Monitoring Study
The Oriskany sampling does not merely show fish contamination in the state of Florida; rather, it shows that more than 100 naval vessels intentionally sunk in the last 10 years alone (through SINKEX and artificial reefing) have placed the marine environment and human health at unreasonable risk of toxic exposure. These risks must be</td><td>Please see BAN – 1 regarding the FWC report findings.</td></tr>
</table>

ID	Organization	Public Comment (Written)	Navy Response
		assessed in the GOA EIS.	
Basel Action Network (BAN) - 7		**IV. Comment: PCB transport via physical and biological means.** The Navy has long argued that PCB releases in the deep ocean from SINKEX vessels (6,000 feet or greater) do not pose adverse risks to marine life at that depth. Further, the Navy has suggested that the deep benthic environment has minimal chance of physical or biological transport to the shallow marine ecosystem. However, the Draft EIS/OEIS does not have any discussion or analysis of PCB releases in the deep ocean and possible transport mechanisms. There are at least three scientifically acknowledged modes of material transport from the deep ocean to shallow waters: 1. Upwelling; 2. Meridional Circulation Overturning; and 3. Biographic Transport.	Please see BAN – 1 regarding the FWC report findings.
Basel Action Network (BAN) - 8		First, the physical marine transport process called *upwelling* routinely moves materials from deep water to surface water.3 Upwelling can occur in coastal regions as well as the open ocean,4 and can be wind or tide-induced. Both types of upwelling do not typically occur in isolation, but rather coexist.5 Upwelling is a vital ecological process that delivers nutrients from the benthic zone (sea floor); however, this same process is also capable of delivering PCBs from sunken Navy vessels to shallow waters.	Please see BAN – 1 regarding the FWC report findings.
Basel Action Network (BAN) - 9		Second, deep ocean currents and water circulation produces dynamic uplift capable of delivering sediments, with which PCBs adhere, to surface waters. Traditionally, this is known as Meridional Circulation Overturning (ocean conveyer belt), in which currents driven by wind, thermohaline circulation, and atmospheric conditions transport deep water to shallow water.6 *3 Tomczak, M.,1998. Shelf and Coastal Oceanography. http://www.es.flinders.edu.au/~mattom/ShelfCoast/notes/chapter06.html* *4 http://oceanmotion.org/html/background/upwelling-and-downwelling.htm* *5 Tomczak, M.,1998. Shelf and Coastal Oceanography. http://www.es.flinders.edu.au/~mattom/ShelfCoast/notes/chapter06.html* *6 http://earthobservatory.nasa.gov/Newsroom/view.php?id=24124*	Please see BAN – 1 regarding the FWC report findings.
Basel Action		Finally, marine life that has taken up PCBs in deep water at	Please see BAN – 1 regarding the FWC report findings.

ID	Organization	Public Comment (Written)	Navy Response
Network (BAN) - 10		the disposal site can transport PCB material via migration and predatory consumption to the shallow marine ecosystem, which can continue up the food chain to humans. Sunken vessels typically rest in the bathylpelagic zone (1,000-4,000 meters), just below the mesopelagic zone (200-1,000 meters), which exists below the epipelagic zone (200 – surface). Biographically speaking, organisms from each zone have contact with organisms from the zone above and below, allowing for food transfer and PCB uptake through the water column. "*Undoubtedly, there is considerable trophic interaction among these larger epipelagic fishes* [albacore, blue shark, swordfish, etc.] *and their meso- and bathypelagic counterparts during diel vertical migration."7*	
Basel Action Network (BAN) - 11		Additionally, the Deep Scattering Layer (DSL) is an assemblage of vertically migrating marine organisms that travel from the deep ocean to the shallows at night to feed, thus trophic interaction occurs.8 DSLs have been recorded at all depths to 3,000 meters.9	Please see BAN – 1 regarding the FWC report findings.
Basel Action Network (BAN) - 12		The physicochemical properties of PCBs, including low solubility in water, very high bioconcentration factor, and very low degradation rates, determine their behavior in the environment.10 And because PCBs are very hydrophobic (readily come out of solution), persistent, and highly lipophilic (partition into lipids and organic carbon) they readily adsorb onto particles and build up in the food chain (bio- and geoaccumulation).11	Please see BAN – 1 regarding the FWC report findings.
Basel Action Network (BAN) - 13		PCBs and other hazardous materials left on SINKEX vessels are in no way confined to the dumping site. PCBs can be transported great distances from the initial sink site via physical and biological means. The GOA EIS must include impact analysis of possible PCB transport mechanisms.	Please see BAN – 1 regarding the FWC report findings.
Basel Action Network (BAN) - 14		In closing, we thank you for the opportunity to submit comments on the draft EIS/OEIS and are hopeful that our concerns will be addressed in the final EIS. Should you have any questions please do not hesitate to contact me directly. Sincerely, Colby Self Basel Action Network *7 Monterey Bay National Marine Sanctuary Site Characterization – Biological Communities and Assemblages – Pelagic*	Please see BAN – 1 regarding the FWC report findings.

ID	Organization	Public Comment (Written)	Navy Response
		Zone.http://montereybay.noaa.gov/sitechar/pelagic5.html *8 IBID* *9 Opdal, A.F., Godo, O.R., Bergstad, O.A., Fiksen, O, 2007. Distribution, identity, and possible processes sustaining meso- and bathypelagic scattering layers on the northern Mid-Atlantic Ridge* *10 Mackay, D., W.Y. Shiu, and K.C. Ma, 1992. Illustrated handbook of physical-chemical properties and environmental fate for organic chemicals, Vol. I, Monoaromatic Hydrocarbons, Chlorobenzens, and PCBs. Lewis Publishers, Boca Raton, FL, 697pp.* *11 Froescheis, Oliver, Ralf Looser, Gregor M. Cailliet, Walter M. Jarman and Karlheinz Ballschmiter, 2000. The deep-sea as a final global sink of semivolatile persistent organic pollutants? Part I: PCBs in surface and deep-sea dwelling fish of the North and South Atlantic and the Monterey Bay Canyon (California), Chemosphere, Volume 40, Issue 6, March 2000, Pages 651-660.*	
Amanda Bentley		I wish to express my concern regarding the Navy's use of mid-frequency active sonar in the Gulf ofAlaska in the summer of 2011. I understand that it is the intention of the Navy to undergo extensive training exercises at that time. I also understand and respect the need to maintain a level of military readiness against any and all potential threats against the United States. However, my goal for writing this letter is to open your eyes to serious and fatal damage that the Navy may inflict upon innocent and endangered marine life. All marine life thrives on the peacefully balanced acoustic environment underwater. Disruptions to this habitat can risk animal life. It is no secret that mid-frequency sonar in aquatic environments even 300 miles from the source retains an intensity of 140 decibels, equating to a hundred times more intense than the level known to alter the behavior of large whales. The use of mid-frequency active sonar is so detrimental that it causes whales and marine mammals to dramatically change their behavior and flee their aquatic habitat forcing them to surface too quickly. Surfacing too quickly causes "the bends" resulting in cranial hemorrhaging. On multiple occasions, whales and sea turtles. too many to count, have been the sacrifice of the Navy's training exercising. Originating from a very patriotic background, I understand and fully support military readiness. However, this sort of environmental harm seems out of control. Countless whales, porpoises and other mammals strand during naval exercises: in October of 1989, 20 whales of three species stranded during naval exercises	The Navy shares your concern for marine resources. The Navy is a leader in funding research to better understand marine species so that training activities can be conducted with the least possible impacts. The biological sections of Chapter 3 of the EIS/OEIS (Sections 3.5-3.9) provide the details of the Navy's analysis and demonstrates that there is little relative risk to living marine resources from sonar use or other training exercises as proposed in the Final EIS/OEIS. For acoustic exposures to result in injury to marine mammals, the sound source has to be very loud and the animal very close (within a few meters) for there to be a direct effect. Mass strandings of whales have occurred as described in Appendix F, however, this occurrence is relatively rare and the reasons it has occasionally happening are therefore not well understood. The Navy has been using mid-frequency and high-frequency active sonar for decades in the Fleet concentration areas of the East Coast, Southern California, and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations as documented in monitoring reports at these training ranges (see "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). The Navy's analysis and history demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. For a discussion on marine mammals and the bends from sonar, please see Section 3.8.7.3 of the FEIS/OEIS and Appendix F, Cetacean

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		near the Canary Islands.; in January of 2006, at least 34 whales beached themselves to avoid the sonar along the coast of the Outer Banks of North Carolina as training was carried out by a naval fleet. In an article published in the Juneau Empire, in January of 2010. it states that the Navy plans to carry out one of three proposed procedures: 1. No action as the Navy would have already reached its status quo of annual training; 2. Called Alternative I, where the Navy increases training to a 21-day period and includes the use of mid-frequency active sonar; lastly 3. Called Alternative 2 which includes Alternative 1 plus a sinking exercise during the three week training period. I urge you to commit to your first option and halt any and all training in the GulfofAlaska; the Navy has already it meet its annual required training between April and October, according to Eric Morrison in "Concerns grow over Navy Sonar training in the Gulf of Alaska" in January, 2010. Even though Shelia Murray, the regional environmental public affairs officer for the Navy, states in the same article. "The Navy does a lot of things to avoid any type of interaction with any type of marine mammal" there still seems to be numerous fatal strandings ofaquatic life. Can the death of innocent marine life be on the Navy's conscience? Can it be on yours? As a citizen of the earth, we all have a responsibility to preserve the life it holds. Exterminating a species, or even endangering its well-being is a serious offense as this action could be irreversible. Every organism, animal and habitat is essential to the balance of the environment I ask that this be taken into consideration during training exercises. I hope you will find it logical and moral to limit the training exercises using such dangerous technology as mid-frequency active sonar.	Stranding Report. With regard to selection an alternative, the decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Greg Brown - 1		**Marine Mammals** The Situation: The Navy has been authorized to take two million mammals per year for the next five years during its training exercises in Hawaii, the west coast, the Gulf of Mexico, and the entire Eastern seaboard; in fact, the Navy wants to deploy sonar in 80% of the world's oceans. Obviously, this issue greatly affects all of Alaska. The immediate Alaskan concern, however, involves proposed Navy training activities in the Gulf of Alaska (GOA). All public comments must be received or	The Navy is not proposing sonar deployment in 80% of the world's oceans. The Navy already uses sonar all over the world's oceans in operational activities. The proposed action in the EIS/OEIS is for training use of sonar not operational or testing use. This EIS/OEIS uses a method for calculating exposures to underwater sound that was developed jointly by the Navy and the National Marine Fisheries Service. This method for evaluating "takes" of marine mammals is a term used to indicate the level of harassment, either A or B, under the

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		postmarked no later than January 25, 2010, so time is of the essence. You may comment online at www. GulfofAlaskaNavyEIS.com. Please see below for points on which to comment. **Marine Mammals** 1. According to the Marine Mammal Commission, "The Gulf of Alaska supports a diversity of marine mammals, a number of which are listed as endangered or threatened under the Endangered Species Act or designated as depleted under the Marine Mammal Protection Act. They include pinnipeds (Stellar sea lions, northern fur seals, and sea otters) and cetaceans (AT1 killer whales, eastern North Pacific right whales, Cook Inlet beluga whales), humpback whales, fin whales, sperm whales, and sei whales .... Several of them are in especially critical conditions.	Marine Mammal Protection Act; the term does not reflect a marine mammal death. Of the approximately 425,000 exposures under the Preferred Alternative, which are estimated without consideration of the Navy's protective measures, only **one** is expected to be a Level A harassment. The remainder are non-injurious Level B exposures. No marine mammal deaths are expected as a result of the proposed training activities. The Navy fully analyzed potential impacts to marine life in Section 3.8 (Marine Mammals) of the EIS/OEIS and is in full compliance with the Marine Mammal Protection Act, the Endangered Species Act, and the National Environmental Policy Act. The analysis concludes that there is no significant impact to population levels of marine mammals. For more information about the Navy's compliance with these and other regulatory requirements, see Section 6 of the EIS/OEIS.
Greg Brown - 2		2. The Ocean Mammal Institute, a federal agency created to help protect marine mammals, stated serious concerns about the effects of the Navy's use of LFAS, explaining that the possible effects on marine mammals could include the following: - death from trauma - hearing loss - disruption of feeding, nursing, sensing and communication (Abandoned calves have been reported in affected areas.) - stress (making animals more vulnerable to disease and predation) - changes in distribution and abundance of important marine mammal prey species - subsequent decreases in marine mammal survival and productivity.	LFA sonar is not part of the Proposed Action; however its effects are described in Section 3.6.2.4 of the EIS/OEIS.
Greg Brown - 3		All of these effects have been witnessed in the past. See the Ocean Mammal Institute's publication "US Navy's Misinformation To Congress About LFAS." Additionally, MSNBC reported that "A National Oceanic and Atmospheric Administration study said the Navy's use of sonar contributed to the beaching of 16 whales and two dolphins in the Bahamas in 2000. Eight of those whales died, showing hemorrhaging around their brains and ear bones, possibly because they were exposed to loud noise. 3. Many scientists believe that animals seen stranded on the beach as a result of Navy sonar testing represent only a	The use of low frequency active sonar (LFAS) is not part of the proposed action for GOA. A discussion of all stranding events potentially associated with the use of sonar, including the Bahamas event of March 2000, are detailed in Section F.1.6.1 of Appendix F of the EIS/OEIS. The best available science is considered in preparation of this EIS/OEIS. As a general matter, the Navy shows consideration of the best available science when we ensure the scientific integrity of the discussions and analyses in the GOA TMAA. Specifically, this EIS/OEIS identifies methods used, references reliable scientific sources, discusses responsible opposing

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		small portion of the technology's toll because severely injured animals rarely come to shore. In fact, scientists believe that mid-frequency sonar blasts may drive certain whales to change their dive patterns in ways their bodies cannot handle, causing debilitating and even fatal injuries; these symptoms are akin to a severe case of 'the bends." (NRDC) In fact, the true effects of Navy sonar testing on marine wildlife remains unknown. 4. The June, 2010 [*sic*] issue of Scientific American reported that the U.S. Navy's sonar generates "slow-rolling sound waves topping out at around 235 decibels, equivalent to the intensity of a Saturn rocket; the world's loudest rock bands top out at only 130. The Navy confirms that these sound waves can travel for hundreds of miles under water, and can retain an intensity of 140 decibels (100 times more intense than the level known to alter the behavior of large whales) as far as 300 miles from their source."	views, and discloses incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR,1502.9 (b),1502.22,1502.24). Please note that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The Navy's analysis indicates and this history indicates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Since sound in the air and sound underwater are measured on two separate scales (Sound Pressure Level is expressed in dB re 1 µPa for underwater sound and dB re 20 µPa for airborne sound), it is incorrect to compare the dB sound level of sonar in water to the dB sound level of jet engines or other loud noises through the air. To clarify a misunderstanding brought up in the comment, proposed sonar use in the TMAA would not result in sound levels of 140 dB as far as 300 miles from the source.
Greg Brown - 4		5. The Navy does not consider the potential cumulative impacts from multiple sound exposures. For example whales in the GOA migrate to Hawaii. The Navy seeks to cover 80% of the world's oceans with its sonar testing, including the west coast of the U.S. as well as Hawaii. Over time, multiple exposures could lead to impaired hearing abilities, as studies on the effects of sound on terrestrial mammals has shown. Too, feeding behavior and other vital behavior could be altered repeatedly, the cumulative effects of which could prove fatal.	Regarding the comment about the Navy seeking to cover 80% of the world's oceans with sonar testing, please see response to Greg Brown – 1 above. Please refer to the EIS/OEIS Chapter 4 regarding cumulative impacts analysis and specifically to Section 4.2.8.3 on Anthropogenic Sound regarding the multiple sound sources present in the Gulf of Alaska. The analysis of sonar use in the EIS/OEIS does take into account the accumulated energy from multiple sound exposures (those exposures in addition to the Risk Function behavioral exposures) and indicates the potential for permanent threshold shift (resulting in an impaired hearing ability) in one (1) individual before any mitigation measures are considered; it is unlikely this one exposure will occur given the mitigation measures.
Greg Brown - 5		6. The Navy does not consider the marine animals that may be affected by sonar at a significant distance from the source.	Under the current regulatory (MMPA) use of the Risk Function, the extent of sound propagating from a source to the point at which it reached 120 dB can be 10s of miles from that source (depending on the environmental conditions); see Section 3.8.7.3. As such, the Navy's analysis does consider the potential that marine mammals may be affected by hearing sonar at significant and various distances from the source.

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Greg Brown - 6		7. The Navy does not take into account the added noise pollution caused by the increase in vessel traffic during training.	Noise associated with vessel movements, along with other potential effects of vessel movements, is described on an individual resource basis in Sections 3.6, 3.7, 3.8, and 3.9 and under Cumulative Impacts in Section 4.2.8.3 of the FEIS/OEIS.
Greg Brown - 7		8. The Navy does not consider the possibility of strikes by sub-surface submarines during transit and/or operations. The Navy lacks any evidence that passive listening is a reliable means of detecting nearby marine life.	The potential for vessel strikes by submarines was not previously addressed but has now been added to Section 3.8.7.6. Use of passive acoustic detection is not 100% effective but is offered as a means for possible detection of marine mammals so that appropriate action can be taken.
Greg Brown - 8		9. Although the risk of surface vessel strikes is heightened by its operations, the Navy does not note the many limitations on the ability to see and avoid collisions with marine mammals, instead repeatedly touting lookouts as an effective means to avoid collisions with whales. The limited effectiveness of using lookouts is widely documented, yet the Navy fails to take into account the difficulty to see animals as well as the fact that many marine mammals remain under water for considerable periods of time. Beaked whales, for example, can spend up to an hour under the surface, with only short and intermittent surface intervals.	Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. While the Navy is very confident in its well-trained lookouts, it does not expect that 100% of the animals present in the vicinity of training events will be detected. However, the acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided. As such, the Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate. Please refer to chapter 5 of the EIS/OEIS which presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events.
Greg Brown - 9		10. The Navy fails to consider the adverse impact of the massive amounts of debris that will be disposed of in the oceans during its training periods. Entanglements are serious concerns for marine mammals, often resulting in death.	Please see response to AMCC – 15. Additionally, as discussed in Section 3.8,, Marine Mammals, potential entanglement of species with expended materials is not a substantial threat within the GOA.
Greg Brown - 10		11. Clearly it is likely that certain impacts on marine mammals from the Navy operations may fall within the category of Level A Harassment.	Please see response to Greg Brown – 1. In addition, please note that without consideration of mitigation measures, there are also five Level A exposures from training events using explosives, however, these are exposures are unlikely to occur given the set-up time for those events, mitigative protective

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			measures, and the species involved (Dall's porpoise, Pacific white-sided dolphin, and northern fur seal). No marine mammal deaths are expected as a result of the proposed training activities. Neither NMFS nor the Navy anticipates that marine mammal stranding events or mortality will result from the use of MFA or HFA sonar during Navy exercises within the TMAA. Given, however, the potential for naturally occurring marine mammal stranding events in GOA (e.g., natural mortality), it is possible that a stranding could co-occur with a Navy exercise even though the stranding is actually unrelated to and not caused by Navy activities. Accordingly, the Navy will include requests for take, by mortality, for three beaked whale species three known species of beaked whales present in the TMAA (Baird's, Cuvier's, and Stejneger's beaked whale).
Greg Brown - 11		**Fish and Other Marine Wildlife** 12. The Navy does not provide analysis of the cumulative effects of sonar testing on commercial fishing, yet the National Marine Fisheries Service believes that sonar testing could directly and indirectly impact federally managed fishery species in North Carolina. (North Carolinians for Responsible Use of Sonar)	Discussion of Cumulative Effects is presented in Chapter 4, including a discussion of the impacts to commercial fishing. Also, as discussed in Chapter 3 (Section 3.6.1.4), fish in general are not likely to hear the mid- and high-frequency sonar proposed for use in the TMAA.
Greg Brown - 12		13. Not everything is known about the effects of sonar on fish, but studies show that intense sound can damage fish's ears, reduce the viability of eggs and harm larvae, and retard growth. Intense sound can also cause fish to change their behavior, disrupt their navigation, communication, foraging, and schooling - and dramatically reduce catch rates. (NC Coastal Federation)	The studies showing damage to fish ears were not based on sounds similar to those produced by the Navy's proposed use of sonar. The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. In areas where sonar use has been ongoing for decades, there is no indication, based upon catch data, that any fish stocks have been affected. Additionally, in an study of herring (one of the few fish that can hear mid-frequency sonar) Doksæter et al. determined that "Military sonars of such frequencies and source levels may thus be operated in areas of overwintering herring without substantially affecting herring behavior or herring fishery" (2009:554).
Greg Brown - 13		14. According to the Times-Standard, "the Navy says that shock waves from inert bombs, intact missiles and targets hitting the water's surface would injure fish in some areas," and that "underwater explosions.. .could hurt invertebrates. ..."	As stated above, the Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. The impacts described are small in area and, if they occur, will only impact small insignificant numbers of fish. As described in the Section 3.6 of the EIS/OEIS, analysis of impacts to fish, including those with swim bladders, explosive ordnance use may result in injury or mortality to individual fish but would not result in impacts to fish populations.. Effects of at-sea explosions on invertebrates are addressed including those possible impacts

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			in Section 3.5, Marine Plants and Invertebrates. As summarized in Section 3.5, surface or near-surface explosions have the potential to kill or harm individual animals and plants in the immediate vicinity resulting in localized impacts. Given the TMAA size and using conservative estimates, 0.02 explosions would occur per nm2 (0.006 per km2) per year resulting in minimal effects. Benthic communities would not be affected by explosions due to water depth.
Greg Brown - 14		15. Walt Duffy with the U.S. Geological Survey's Cooperative Research Unit at Humboldt State University points out that there is limited information on the effects of sound on fish. He said that "how the activities the Navy proposes might affect surfacing and migrating salmon are also open to question." (Times-Standard)	See Section 3.6.1.4 for discussion on hearing ranges in fish and also Sections 3.6.2.3 through 3.6.2.5 for discussion of effects of proposed actions on fishes (explosive sounds, sonar usage, etc.) This information is based on the best available science and research being conducted by the Navy, and while hearing information on Pacific salmon is limited, the section does discuss hearing in Atlantic salmon, which are similar anatomically to Pacific salmon and indicates that they cannot hear mid- and high frequency sonar, and would be expected to have similar responses to sound. The range of acoustic effects analyzed includes no effects, small behavioral effects, significant behavioral effects, temporary loss of hearing, and physical damage. Potential effects of explosive charge detonations on fish and EFH include disruption of habitat; exposure to chemical by-products; disturbance, injury, or death from the shock (pressure) wave; acoustic impacts; and indirect effects including those on prey species and other components of the food web. The conclusions of the assessment are based on regulatory criteria for impact determination. Given the localized and infrequent nature of the activities, the Navy has determined that the proposed training would not have an impact on fish populations. While individual fish may be harmed if they co-occur with some activities, this would not have any impact on the overall population. Therefore the minimal effect determination does not imply that individual fish would not be affected, but based on the regulatory criteria, that impacts from the proposed activities would not constitute a population-level effect (i.e., adverse impact).
Greg Brown - 15		16. Arthur N. Popper, biology professor at the university of Maryland and expert in fish hearing, states, 'The effects of sound on fish could potentially include increased stress, damage to organs, the circulatory and nervous systems. Long-term effects may alter feeding and reproductive	Note that the analysis by Dr. Popper is for sounds that fish can hear and all indications are that most fish cannot hear the Navy's mid- and high-frequency sonars proposed for use in the TMAA. As described in the EIS/OEIS, of which Dr. Popper is one of the authors, analysis of impacts to fish, including those

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		patterns in a way that could affect the fish population as a whole."	with swim bladders, are found in Section 3.6 of the EIS/OEIS. While there may be a few species that can hear within this range, it is anticipated that the effects could range from no effect to physical damage and that it would be dependent on intensity and proximity (basically the list of potential effects that was provided in Section 3.6.2.2.3). Given the temporal and spatial nature of the activities, it is anticipated that any effect would be localized and not affect fish populations as a whole.
Greg Brown - 16		17. The reproductive functions of shrimp and crabs may also be affected by intense underwater noise. (NC Coastal Federation)	Effects of underwater noise on invertebrates are described in Marine Plants and Invertebrates; Sections 3.5.2.3, 3.5.2.4, and 3.5.2.5. Surface or near-surface explosions have the potential to kill or harm individual animals and plants in the immediate vicinity resulting in localized impacts. Given the TMAA size and using conservative estimates, 0.02 explosions would occur per nm2 (0.006 per km2) per year resulting in minimal effects. Benthic communities would not be affected by explosions due to water depth.
Greg Brown - 17		18. The Navy has not considered the possible effects on seabirds.	Section 3.9 of the EIS/OEIS provides a thorough analysis of potential impacts to birds. This analysis concluded that the Navy's activities would have no significant impacts to birds. Additionally, the Navy entered into informal ESA Section 7 consultation with the U.S. Fish and Wildlife Service. The USFWS has concurred with the Navy's determination of "may affect, not likely to adversely affect" short-tailed Albatross, the only threatened and endangered seabird potentially present within the TMAA on 24 March, 2010. Please see Appendix C, Regulatory Communications.
Greg Brown - 18		**Humans and Marine Wildlife** 19. The Navy has not addressed the issue of sea pollution. Humans cannot survive without a healthy ocean, and already the North Pacific is known for the North Pacific Gyre, a plastic "graveyard" at least twice the size of Texas; some believe it to be as large as the entire continental United States.	Please see response to AMCC – 15. Additionally, shipboard waste-handling procedures governing the discharge of nonhazardous waste streams have been established for commercial and Navy vessels. These categories of wastes include solids (garbage) and liquids such as "black water" (sewage), "gray water" (water from deck drains, showers, dishwashers, laundries, etc.), and oily wastes (oil-water mixtures). The Navy will comply with waste discharge restrictions, as described in Section 3.3.1.2, and would not discharge plastic at any location. It is all recycled and disposed of in port.
Greg Brown - 19		20. The Navy has not addressed the issue of air pollution.	Air Quality, including estimates of the quantities of regulated air pollutants to be emitted by the Preferred Alternative, is addressed on pages 3.1-1 through 3.1-14 of the EIS/OEIS.

ID	Organization	Public Comment (Written)	Navy Response
Greg Brown - 20		**Closing** - In October 2004 the European Parliament called for a ban in European waters of military sonar equipment and asked its twenty-five member states to stop deploying high-intensity active naval sonar, (Marine Connection) - In November 2004, delegates at the meeting of the parties to ACCOBAMS (the United Nations Environment Program's Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area) adopted a resolution recognizing that ocean noise generated by humans is a dangerous pollutant to marine life. (Marine Connection) - In November 2004, the World Conservation Union called for action to reduce the impact of high-intensify active sonar and other sources of damaging underwater sound. (Marine Connection) (-) The North Carolina Watermen United has presented a statement opposing Naval sonar training off the coast of North Carolina.	This comment is duly noted.
Greg Brown - 21		*Alaskans depend on the sea for food, for income, and for pleasure. Clearly the Navy needs to train, but choosing training areas in some of the most prolific marine wildlife regions in the United States, if not the world, particularly at a time when migrating marine life is present, is, at best, irresponsible. We therefore support the "No Action Alternative," which provides for the continuation of training activities within the Alaska area at the current levels. Additional sources: Southern Environmental Law Center, Atlanta, Georgia Turning the Tides, Sika, Alaska, Chapter, Lynn Wilbur	The Navy is aware that this is one of the richest marine areas in the world and has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS. Specifically, socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. Regarding alternatives selection, please see response to AMCC – 3.
Tina Brown - 1		**Marine Mammals** The Situation: The Navy has been authorized to take two million mammals per year for the next five years during its training exercises in Hawaii, the west coast, the Gulf of Mexico, and the entire Eastern seaboard; in fact, the Navy wants to deploy sonar in 80% of the world's oceans. Obviously, this issue greatly affects all of Alaska. The immediate Alaskan concern, however, involves proposed Navy training activities in the Gulf of Alaska (GOA). All public comments must be received or postmarked no later than January 25, 2010, so time is of the essence. You may comment online at www.	Please see response to Greg Brown – 1.

ID	Organization	Public Comment (Written)	Navy Response
		GulfofAlaskaNavyEIS.com. Please see below for points on which to comment. **Marine Mammals** 1. According to the Marine Mammal Commission, "The Gulf of Alaska supports a diversity of marine mammals, a number of which are listed as endangered or threatened under the Endangered Species Act or designated as depleted under the Marine Mammal Protection Act. They include pinnipeds (Stellar sea lions, northern fur seals, and sea otters) and cetaceans (AT1 killer whales, eastern North Pacific right whales, Cook Inlet beluga whales), humpback whales, fin whales, sperm whales, and sei whales .... Several of them are in especially critical conditions. .. .	
Tina Brown - 2		2. The Ocean Mammal Institute, a federal agency created to help protect marine mammals, stated serious concerns abut the effects of the Navy's use of LFAS, explaining that the possible effects on marine mammals could include the following: - death from trauma - hearing loss - disruption of feeding, nursing, sensing and communication (Abandoned calves have been reported in affected areas.) - stress (making animals more vulnerable to disease and predation) - changes in distribution and abundance of important marine mammal prey species - subsequent decreases in marine mammal survival and productivity. All of these effects have been witnessed in the past. See the Ocean Mammal Institute's publication "US Navy's Misinformation To Congress About LFAS." Additionally, MSNBC reported that "A National Oceanic and Atmospheric Administration study said the Navy's use of sonar contributed to the beaching of 16 whales and two dolphins in the Bahamas in 2000. Eight of those whales died, showing hemorrhaging around their brains and ear bones, possibly because they were exposed to loud noise."	Please see response to Greg Brown – 2.
Tina Brown - 3		3. Many scientists believe that animals seen stranded on the beach as a result of Navy sonar testing represent only a small portion of the technology's toll because severely injured animals rarely come to shore. In fact, scientists believe that mid-frequency sonar blasts may drive certain	Please see response to Greg Brown – 3.

ID	Organization	Public Comment (Written)	Navy Response
		whales to change their dive patterns in ways their bodies cannot handle, causing debilitating and even fatal injuries; these symptoms are akin to a several case of 'The bends." (NRDC) In fact, the true effects of Navy sonar testing on marine wildlife remains unknown. 4. The June, 2010, issue of Scientific American reported that the U.S. Navy's sonar generates "slaw-rolling sound waves topping out at around 235 decibels, equivalent to the intensity of a Saturn rocket; the world's loudest rock bands top out at only 130. The Navy confirms that these sound waves can travel for hundreds of miles under water, and can retain an intensity of 140 decibels (100 times more intense than the level known to alter the behavior of large whales) as far as 300 miles from their source."	
Tina Brown - 4		5. The Navy does not consider the potential cumulative impacts from multiple sound exposures. For example whales in the GOA migrate to Hawaii. The Navy seeks to cover 80% of the world's oceans with its sonar testing, including the west coast of the U.S. as well as Hawaii. Over time, multiple exposures could lead to impaired hearing abilities, as studies on the effects of sound on terrestrial mammals has shown. Too, feeding behavior and other vital behavior could be altered repeatedly, the cumulative effects of which could prove fatal.	Please see response to Greg Brown – 4.
Tina Brown - 5		6. The Navy does not consider the marine animals that may be affected by sonar at a significant distance from the source.	Please see response to Greg Brown – 5.
Tina Brown - 6		7. The Navy does not take into account the added noise pollution caused by the increase in vessel traffic during training.	Please see response to Greg Brown – 6.
Tina Brown - 7		8. The Navy does not consider the possibility of strikes by sub-surface submarines during transit and/or operations. The Navy lacks any evidence that passive listening is a reliable means of detecting nearby marine life.	Please see response to Greg Brown – 7.
Tina Brown - 8		9. Although the risk of surface vessel strikes is heightened by its operations, the Navy does not note the many limitations on the ability to see and avoid collisions with marine mammals, instead repeatedly touting lookouts as an effective means to avoid collisions with whales. The limited effectiveness of using lookouts is widely documented, yet the Navy fails to take into account the difficulty to see animals as well as the fact that many marine mammals	Please see response to Greg Brown – 8.

ID	Organization	Public Comment (Written)	Navy Response
		remain under water for considerable periods of time. Beaked whales, for example, can spend up to an hour under the surface, with only short and intermittent surface intervals.	
Tina Brown - 9		10. The Navy fails to consider the adverse impact of the massive amounts of debris that will be disposed of in the oceans during its training periods. Entanglements are serious concerns for marine mammals, often resulting in death.	Please see response to Greg Brown – 9.
Tina Brown - 10		11. Clearly it is likely that certain impacts on marine mammals from the Navy operations may fall within the category of Level A Harassment.	Please see response to Greg Brown – 10.
Tina Brown - 11		**Fish and Other Marine Wildlife** 12. The Navy has not evaluated the consequences of its sonar on marine fish.	All indications are that most fish cannot hear the Navy's mid and high frequency sonar proposed for use in the TMAA. Effects of sonar on marine fish are described in Section 3.6, Fish. For additional information, please see response to Greg Brown – 12 and 15.
Tina Brown - 12		12. The Navy does not provide analysis of the cumulative effects of sonar testing on commercial fishing, yet the National Marine Fisheries Service believes that sonar testing could directly and indirectly impact federally managed fishery species in North Carolina. (North Carolinians for Responsible Use of Sonar)	Please see response to Greg Brown – 11.
Tina Brown - 13		13. Not everything is known about the effects of sonar on fish, but studies show that intense sound can damage fish's ears, reduce the viability of eggs and ham larvae, and retard growth. Intense sound can also cause fish to change their behavior, disrupt their navigation, communication, foraging, and schooling - and dramatically reduce catch rates. (NC Coastal Federation)	Please see response to Greg Brown – 12.
Tina Brown - 14		14. According to the Times-Standard, "the Navy says that shock waves from inert bombs, intact missiles and targets hitting the water's surface would injure fish in some areas," and that "underwater explosions.. .could hurt invertebrates. ..."	Please see response to Greg Brown – 13.
Tina Brown - 15		15. Walt Duffy with the U.S. Geological Survey's Cooperative Research Unit at Humboldt State University points out that there is limited information on the effects of sound on fish. He said that "how the activities the Navy proposes might affect surfacing and migrating salmon are also open to question." (Times-Standard)	Please see response to Greg Brown – 14.

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Tina Brown - 16		16. Arthur N. Popper, biology professor at the university of Maryland and expert in fish hearing, states, “The effects of sound on fish could potentially include increased stress, damage to organs, the circulatory and nervous systems. Long-term effects may alter feeding and reproductive patterns in a way that could affect the fish population as a whole."	Please see response to Greg Brown – 15.
Tina Brown - 17		17. The reproductive functions of shrimp and crabs may also be affected by intense underwater noise. (NC Coastal Federation)	Please see response to Greg Brown – 16.
Tina Brown - 18		18. The Navy has not considered the possible effects on seabirds.	Please see response to Greg Brown – 17.
Tina Brown - 19		**Humans and Marine Wildlife** 19. The Navy has not addressed the issue of sea pollution. Humans cannot survive without a healthy ocean, and already the North Pacific is known for the North Pacific Gyre, a plastic "graveyard" at least twice the size of Texas; some believe it to be as large as the entire continental United States.	Please see response to Greg Brown – 18.
Tina Brown - 20		20. The Navy has not addressed the issue of air pollution.	Please see response to Greg Brown – 19.
Tina Brown - 21		**Closing** - In October 2004 the European Parliament called for a ban in European waters of military sonar equipment and asked its twenty-five member states to stop deploying high-intensity active naval sonar, (Marine Connection) - In November 2004, delegates at the meeting of the parties to ACCOBAMS (the United Nations Environment Program's Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area) adopted a resolution recognizing that ocean noise generated by humans is a dangerous pollutant to marine life. (Marine Connection) - The North Carolina Watermen United hes presented a statement opposing Naval sonar training off the coast of North Carolina.	This comment is duly noted.
Tina Brown - 22		*Alaskans depend on the sea for food, for income, and for pleasure. Clearly the Navy needs to train, but choosing training areas in some of the most prolific marine wildlife regions in the United States, if not the world, particularly at a time when migrating marine life is present, is, at best, irresponsible. We therefore support the "No Action	Please see response to Greg Brown – 21.

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		Alternative," which provides for the continuation of training activities within the Alaska area at the current levels. Additional sources: Southern Environmental Law Center, Atlanta, Georgia Turning the Tides, Sika, Alaska, Chapter, Lynn Wilbur	
Civil Air Patrol (CAP) 2LT Daniel Holt		How can CAP be involved, help with your training activities?	The proposed action does not necessitate the use of the CAP but thank you for your offer.
Cordova District Fishermen United (CDFU) - 1		Dear Mrs. Burt, I am writing in response to the Draft Environmental Impact Statement relating to the Gulf of Alaska Navy Training activities. Cordova District Fishermen United (CDFU) would like to clearly state for the record that we support the U.S. Navy in their efforts to defend our great country, however we are strongly opposed to an increase in U.S Navy training exercises in the Gulf of Alaska (GOA), and in particular the use of mid-frequency sonar. We support the No Action Alternative and support a review of existing practices. CDFU is a nonprofit political advocacy organization that directly represents the commercial fishing interests of over 1,000 fishermen in Prince William Sound, and indirectly supports the economic livelihood of the community of Cordova. For over 75 years, CDFU has strived to protect the health and sustainability of species that inhabit our waters and errs on the side of caution when assessing potential risks to these species.	This comment is duly noted. Please see response to AMCC – 3.
CDFU - 2		As you should be aware through your extensive EIS process, Alaska has one of the richest ocean environments in the world, and the sustainability of our fisheries resources is of highest priority to our State - both from an economic and cultural perspective.	The Navy is aware that this is one of the richest marine areas in the world and has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS. Specifically, socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics.
CDFU - 3		Thank you for the opportunity to comment on the Draft EIS. CDFU looks forward to reviewing the Final EIS and requests inclusion on the Navy postal mailing list to receive a full, printed copy when it is published. Additionally, CDFU would like to request that the comment period for the Final EIS be increased to provide sufficient time for Alaska communities to respond - longer than the timeframe given during the comment period for the draft EIS, and at least 90 days. Sincerely, Rochelle van den Broek - Executive Director	Your request has been acknowledged and you will be included on the mailing list for a full printed copy of the FEIS/OEIS. The Navy will comply with NEPA requirements for release of the FEIS.

ID	Organization	Public Comment (Written)	Navy Response
CDFU - 4		**CDFU COMMENTS** **Section: 4.1.3.1 Fishing & Section 2.6 FISH** During the explanation of commercial fishing activities there is a vague mention that a number of fisheries are at very depressed levels or are closed (referencing Richardson and Erickson 2005). The remainder of this section goes on to describe those fisheries that are currently in operation. As acknowledged in the Draft EIS, Pacific Herring (Clupea Palladio) are present in the GOA. Despite the fact that this commercial fishery is currently not in operation, Pacific Herring are an ecologically and commercially significant species in the Gulf of Alaska and Prince William Sound ecosystem. Few species are of greater combined ecological and economic importance in Prince William Sound (and in many other coastal ecosystems) than is the Pacific herring[1]. ..... 1 Brown ED and MG Carls. 1998. Pacific Herring Clupea Pallasi. Restoration Notebook, Sept. 1998. Exxon Valdez Oil Spill Trustee Council.	This comment is duly noted and the Navy concurs that Pacific Herring are an ecologically and commercially significant species in the Gulf of Alaska. The EIS/OEIS fully analyzed potential impacts to fish. As was described in Sections 3.6.1.4, fish have very limited hearing in the frequency range of Navy sonar, and the body of research indicates they are not negatively impacted by Navy sonar. Specifically, a study of herring (one of the few fish that can hear mid-frequency sonar) Doksæter et al. determined that "Military sonars of such frequencies and source levels may thus be operated in areas of overwintering herring without substantially affecting herring behavior or herring fishery" (2009:554). As such, the impact conclusion in the EIS/OEIS, that there is no significant impact to population levels for fish, including Pacific Herring, from Navy activities, is fully supported by scientific research.
CDFU - 5		Pacific Herring are central to the marine food web; providing food to marine mammals, birds, invertebrates and other fish. The Exxon Valdez Oil Spill Trustee Council (EVOSTC), a council charged with overseeing the restoration of the injured ecosystem through the use of the $900 million civil settlement and which consists of three state and three federal trustees (or their designees), has classified Pacific Herring as damaged and "Not Recovering"[2]. Pacific herring have not met their recovery objective. No strongly successful year class has been recruited into the population and health indices suggest that herring in the Sound are not fit. Pacific herring are the subject of ongoing Trustee Council-funded research. Through this research, and the work of the Alaska Department of Fish and Game, Prince William Sound communities are hopeful for the return of a viable herring fishery in the future and are actively working towards this goal. The collapse of the Pacific Herring fishery following the Exxon Valdez oil spill indicates that this species is not particularly resilient to changes in their immediate marine environment. CDFU is concerned that the effects of mid-frequency sonar use in the GOA will stress an already	Please see response to CDFU – 4 above.

ID	Organization	Public Comment (Written)	Navy Response
		weakened population and do not feel that this species was adequately addressed in the Draft EIS. ..... [2] Exxon Valdez Oil Spill Trustee Council. Nov, 2006. Exxon Valdez Oil Spill Restoration Plan. Update on Injured Resources and Services 2006.	
CDFU - 6		**Acoustic Effects of Underwater Sounds to Fish** Despite their lack of resilience to changes in their environment, Pacific Herring (Clupeidae) have the highest hearing range indicated of all marine species identified in the GOA, at 5 kHz. Some studies, however, demonstrate that the hearing range of the Pacific Herring is in fact much greater. Wilson and Dill (2002) reported that Pacific herring (Clupea pallasii) responded to sounds up to 140 kHz. As hearing "specialists", Pacific Herring have the ability to hear over a much wider frequency range than most other fish.	Please see response to CDFU – 4 above.
CDFU - 7		Of grave concern to CDFU is the lack of available research that demonstrates the short and long term impacts to fish and marine mammals. It is apparent that there is very limited research available that focuses on the impacts of mid-frequency sonar use to fish, Pacific Herring in particular and the limited research that is available suggests that there is not only variation in effects of intense sound sources on different species of fish, but that there may also be differences based on genetics or development. Indeed, one can go even further and suggest that there may ultimately be differences in effects of sound on fish (or lack of effects) that are related to fish age as well as development and genetics, as was demonstrated by Popper et al. (2005). Many references included in this section cite data based on freshwater fish, species not included in the GOA, and entirely different environmental conditions. These references do not fully describe the impacts to GOA specific species as there simply is not research available in this area.	Please see response to Greg Brown – 3. Additionally, Earlier studies involving high intensity sound sources are distinguishable from the current conditions within the TMAA. As discussed within pages 3.6-39 to 3.6-43 and the analysis within Popper (2008); because only a few species of fish may be able to hear the relatively higher frequencies of mid-frequency sonar, sonar used in Navy exercises would result in minimal harm to fish or EFH.
CDFU - 8		Since the collapse of the herring fishery in 1996, millions of dollars have been expended to help scientists understand more about the inability of Pacific Herring to fully recover from the impacts of the Exxon Valdez oil spill. The ultimate goal of this research is to work towards the restoration of the Pacific Herring fishery returning it to its former abundance. The lack of adequate research on mid-frequency sonar on Pacific Herring, and other fish species in the Gulf of Alaska	This comment is duly noted. There are many areas of science where additional research is needed. With respect to existing studies completed to date on sonar effects on herring, the Navy and NMFS have reviewed existing literature and studies on this subject.

ID	Organization	Public Comment (Written)	Navy Response
		is alarming. It is incomprehensible that a Department of U.S. Government (EPA or the DOD) would support any alternative other than the No Action alternative based on this lack of information and available research.	
CDFU - 9		**4.2.8.2 Ship Strikes** This section states that releasing individual expended materials would not have any significant effects on the environment, but does not indicate whether the cumulative effect of adding specific contaminants into the marine environment was fully analyzed. Elevated concentrations of certain chemicals can cause adverse effects on aquatic biota including reduced survival, impaired reproduction, and reduced growth. Release of toxic substances in the water may be quickly diluted; however, some toxic substances have the potential to bioaccumulate in the food chain. Information included in the Draft EIS is not sufficient to detail the myriad of toxic chemicals that will be released into GOA waters, and the tendency of each specific chemical to bioaccumulate. A table describing each chemical's tendency to bioaccumulate (or not) would more accurately demonstrate the long-term environmental impacts of the proposed training activities. Currently, this area is severely lacking despite the extreme quantities of foreign chemicals that are proposed to be expended in the GOA. It is likely that this too is an area where research is lacking.	This comment is duly noted as is your concern regarding bioaccumulation. Specifically, the potential effect to species and habitats in the GOA and additional research. The Navy did not include a table describing each chemicals tendency to bioaccumulate because bioaccumulation effects must be handled according to impact to individual species. Section 3.2 of the FEIS/OEIS identifies the expended materials that are part of the proposed action and the effects known to date of these chemicals. The bioaccumulation process is discussed in this EIS/OEIS in Section 3.8 and Section 4.2.8.2. A detailed species by species analysis of bioaccumulation potential for all possible contaminants is not possible with the best available scientific data at this time. Impacts from bioaccumulation present a large and complex set of variables, including marine mammal and fish occurrence in the TMAA, population size, toxicity to each individual species, and habitat types and characteristics of the TMAA. An analysis of this magnitude would overwhelm the reader with details and scientific data, without adding substantial value to the overall analysis conclusions. Due to the short-term duration and impacts of Navy training activities in the GOA, bioaccumulation impacts are not significant.

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CDFU - 10		**Table 3.2-2: Failure and Low-Order Detonation Rates of Militant Ordnance** The failure rate of guns, grenades, rockets, etc. ranges from 1.78% to 8.23%. Representation as a percentage does not clearly articulate the amount of ordnance that is left in an unexploded state. As indicated in the Draft EIS, the training activities will take place in an area frequented by commercial fishermen. An increase in training activities will increase the percentage of unexploded ordnance left on the ocean floor. While the training area is large, there is no way to predict where a commercial fisherman will place their net. The fishing process can include dragging nets across the ocean floor. Unstable, unexploded ordnance poses the potential for significant risk to commercial fishermen. It is incomprehensible that the Draft EIS does not include any information on this inherent risk to public safety.	The DEIS addresses the use of live ordnance and the potential for ordnance items to not function as designed (i.e., dud) in Section 3.2 of the EIS/OEIS. In general though, undetonated ordnance could pose a risk to fishermen, particularly those fishing by bottom trawling. If a trawl were to contact undetonated ordnance, it could trigger a detonation. Most likely, the ordnance would not detonate for the same reason it failed to detonate upon impact with a training target or the water surface. Based on the number of live explosive ordnance used under Alternative 2 and the estimated failure rate, there would be approximately 0.007 undetonated explosive items per square nautical or one undetonated explosive item per 140 square nautical miles. While fisherman could contact undetonated ordnance, it would be unlikely given the large area of the TMAA. Text describing potential effects on public safety from undetonated ordnance has been added to Sections 3.14.2.3, 3.14.2.4, and 3.14.2.5 of the Final EIS/OEIS.
CDFU - 11		**3.7.8 At-Sea Explosions** Mitigation measures used to protect marine mammals may be inadequate. The Navy uses visual inspection and passive sonar to detect marine mammals prior to and during training activities. Passive sonar does not indicate the location of marine mammals, only that they are in the vicinity. The Navy will not cease training activities simply because they detect a marine mammal on the passive sonar; they will primarily rely on visual inspections to detect marine mammals and will only cease activities if the marine mammal comes within 200 yards. Marine mammals will only be detected when they come to the water's surface, thus they may have already entered the critical threshold area before they are spotted. Migration patterns should be studied and training exercises should occur outside of their migration routes.	The Navy does not claim or expect 100% of the animals present in the vicinity of training events will be detected, however, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. As detailed in the introduction to Chapter 5, the Navy and NMFS as a cooperating agency have reviewed other potential mitigations measures as described.
CDFU - 12		Ordnance cannot be released and explosives cannot be detonated until the target area is determined to be clear. Training activities are halted immediately if cetaceans, pinnipeds, or sea turtles are observed in the target area. The Gulf of Alaska is prone to extreme weather and severe storms occurring regularly during the intended training exercise timeframe. The Draft EIS is lacking information relating to adverse weather conditions and how this would significantly impede Navy's ability to visually detect marine mammals and large schools of fish. This topic is briefly	The Navy believes it mitigation measures (Chapter 5) are effective and the monitoring reports substantiate this belief. (Please see "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]).

ID	Organization	Public Comment (Written)	Navy Response
		mentioned in Operating Procedures & Collision Avoidance however mitigation in this scenario is not well defined.	
CDFU - 13		**Other** Information on the migration patterns of fish is not sufficient. More information is needed in this area to fully describe the potential impact an increase in training activities might have to salmon returning to Prince William Sound and the Copper River.	The ocean migrations of salmonids was defined by Pearcy (1992) as 1) the coastal phase of juveniles, 2) the oceanic feeding phase, 3) the return of maturing fish from oceanic to coastal waters, and 4) coastal migrations of adults that terminate in freshwater. The distance traveled and the time spent in each of these phases vary greatly within and among species. Pacific salmon smolts from the Pacific Northwest and California generally move up and around the West Coast of North America following the continental shelf. Juvenile salmon, including those originating from Alaska (such as the Copper River), were found to remain over the continental shelf until the start of the Aleutians before moving offshore into the Gulf of Alaska. As such, many salmon species from Alaska, California, Washington, and Oregon would be expected to be present in the Gulf of Alaska for at least part of their oceanic feeding phase. For more information on fish migration patterns, please see Section 3.6.1.2 of the EIS/OEIS.
Douglas Dobyns - 1		In conducting exercises under either alternative 1 or 2, it would be good to have monitoring of the distributions and population densities of marine mammals - in study times of before, during and afterwards of equal durations - to assess whether the mammals have been herded into particular areas.	As described in Section 5.2.1.3, the Navy is planning to implement a comprehensive monitoring plan to determine if there are any observable effects from training activities. The Navy takes environmental stewardship very seriously and has been and will continue to be a leading sponsor of marine mammal research. The Navy provides a significant amount of funding and support to marine research. In the past five years the agency funded over $100 million ($26 million in FY08 alone) to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals. For additional information on Navy research efforts, refer to Chapter 5, pages 5-19 and 5-20 of the Draft EIS/OEIS.
Douglas Dobyns - 2		The concern for this comment is that feeding of these marine mammals might be concentrated in areas where their ecosystem impacts are unusually concentrated.	Due to the temporary nature of the training, the constant movement of the participants, and the established mitigation measures that are in place, training will not have a concentrated effect on any areas such as where marine mammals may be feeding. In addition, concentrations of marine mammals engaged in feeding are much more likely to be detected and thus avoided by Navy training event participants.
Douglas Dobyns - 3		The longer-term impacts to commercial fishing should be known, if there are any.	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the Final

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			EIS/OEIS, analysis of impacts to fish, including those with swim bladders, are found in Section 3.6 of the DEIS. Based on the analysis in Section 3.6 and discussion of Socioeconomic impacts within Sections 3.12.2.3 through 3.12.2.5, Navy training activities will not impact commercial fisheries in the Gulf of Alaska. Cumulative impacts are addressed in Chapter 4 of the Final EIS/OEIS.
Douglas Dobyns - 4		Also, inter-species of marine mammal behavior should be assessed to find if exercises have caused changes.	The Navy is very concerned about the environment and is a leading sponsor of marine mammal research. The Navy provides a significant amount of funding and support to marine research. Please see response to Douglas Dobyns – 1 above regarding Navy funding and research.
EPA Region 10 - 1		Dear Ms. Burt: EPA has reviewed the above-referenced document (CEQ No. 20090424) in accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act. Section 309 specifically directs EPA to review and comment in writing on the environmental impacts associated with all major federal actions. Under our policies and procedures, we assign a rating to the Draft EIS/OEIS (herein EIS) based on the environmental impacts of the proposed action and the document's adequacy in meeting NEPA requirements. The EIS evaluates the potential impacts associated with current and proposed Navy training activities within the Temporary Maritime Activities Area (TMAA) located in the Gulf of Alaska (GOA). The TMAA covers an area of 42,146 square nautical miles (nm2) of surface and subsurface ocean training area and overlying airspace. The No Action Alternative evaluates the current level of Navy training in the TMAA, which entails an annual exercise of one joint force exercise occurring over a period of no more than 14 days during the summer months. Alternative 1 includes the activities under the No Action Alternative, as well its anti-submarine warfare training, use of active sonar, and incorporation of additional training activities to incorporate force structure changes. The period for training would also increase up to 21 days. Alternative 2, the Navy's Preferred Alternative, would essentially double the activity under Alternative 1 as well as incorporate a SINKEX exercise, up to 2 times per year. Overall we find the document to be well-organized, and the	Thank you for your input and recommendations for improving the Navy's EIS/OEIS.

ID	Organization	Public Comment (Written)	Navy Response
		tables and maps that are included are very helpful to the reader. We recognize the short-term nature of these activities, and applaud the Navy for developing an EIS in an attempt to fully evaluate the impacts of these activities. We also appreciate that the Navy considered to the extent possible other influences and stressors on resources in the TMAA, such as climate. change, and went to great lengths to include a quantitative comparison of alternatives that clearly identifies the differences in impacts amongst those alternatives.	
EPA Region 10 - 2		We do have concerns, however, regarding the limited range of alternatives considered, the analysis and disclosure of impacts, lack of analysis of wastewater discharges, impacts from munitions, impacts to marine mammals from mid-range active sonar, and the limited discussion regarding mitigation activities (such as turtle-free zones).	This comment is duly noted.
EPA Region 10 - 3		We also offer some suggestions we believe would improve the analysis, such as: -incorporating more detailed information on EPA's general permit and the related Letter Agreement for SINKEX, G307	This comment is duly noted. Text from the August 1999 SINKEX Letter of Agreement and MPRSA general permit regarding requirements for removal of PCBs and the estimated amount of PCBs remaining on vessels (approximately 100 lb per vessel, based on SINKEX Letter of Agreement) has been incorporated into Section 3.2.2.2 of the Final EIS/OEIS and analysis of Alternative 2 (Section 3.2.2.6).
EPA Region 10 - 4		and current information for the PM 2.5 designation for the Fairbanks area, for your inclusion in the Final EIS (Enclosure 1).	In October 2009, the Fairbanks North Star Borough was designated as nonattainment for $PM_{2.5}$, based on the increased stringency of the $PM_{2.5}$ 24-hr standard from 65 $\mu g/m^3$ to 35 $\mu g/m^3$. The discussion of the regulatory status of the Fairbanks North Star Borough air basin has been updated in Section 3.1.1.1 of the Final EIS/OEIS.
EPA Region 10 - 5		We have assigned a rating of "EC-2" (Environmental Concerns-Insufficient Information) to the Gulf of Alaska Navy Training Activities Draft EIS. A copy of EPA's rating system criteria used in conducting our environmental review is enclosed (Enclosure 2). Our rating and a copy of our comments will be published in the *Federal Register*. Thank you for the opportunity to review and provide written comments on the Gulf of Alaska Navy Training Activities Draft EISI/OEIS. If you have any questions regarding this letter, please do not hesitate to contact Jennifer Curtis of my staff at (907) 271-6324 or *curtis.jennifer @epa.gov.* Sincerely, Christine B. Reichgott, Manager, Environmental Review and Sediment Management Unit	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
EPA Region 10 - 6		**ENCLOSURE 1** **EPA REGION 10 DETAILED COMMENTS ON THE GULF OF ALASKA NAVY TRAINING EXERCISES DRAFT EIS/OEIS** **Limited Range of Alternatives** The EIS evaluates a limited range of alternatives. We believe the alternatives analysis would be much improved by including alternatives that represent a more diverse level and mix of training instead of evaluating alternatives that simply build upon one another. The inclusion of an alternative with additional appropriate mitigation (40 CPR 1502.14(f)) would also expand the range of alternatives.	For EISs that study management levels of Federal assets, the no-action alternative is seen as the current management level of asset usage-in this case, status-quo as the current level of range usage. The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027). Alternatives 1 and 2 discuss the increase from these levels. The Navy has discussed all alternatives that were considered but eliminated in Section 2.3.2. Mitigation measures are examined in Chapter 5.
EPA Region 10 - 7		The use of geographic and/or temporal exclusions, even within the current timeframe and TMAA, can potentially be effective in reducing impacts to marine resources. We note that the DEIS considers this suggestion in the section discussing alternatives considered but dismissed (Section 2.3.2), but does not consider restrictions within the TMAA or identified timeframe.	As discussed in Section 3.8, the boundaries of the TMAA were adjusted to avoid the designated Critical Habitat for Steller sea lions. Mitigation measures presented in Chapter 5 are implemented as appropriate wherever marine mammals are detected and have been proven to be effecting in reducing impacts. As stated in the EIS/OEIS, and in public articulations of the professional military judgment of senior Navy leaders, alternatives that would impose geographic and/or temporal limitations on training within the GOA TMAA would not support the purpose and need. Additionally, limitations are inconsistent with the requirements for training in the TMAA and would remove the realism needed for accomplishing this critical training.
EPA Region 10 - 8		EPA supports the selection of alternatives that minimize the impacts to the environment while meeting the project's purpose and need. For this project, we identify Alternative 1 as the action alternative with the least impacts.	This comment is duly noted.
EPA Region 10 - 9		***Recommendation*** *EPA recommends that an alternative with additional mitigation measures be developed in the Final EIS, possibly incorporating geographic and/or temporal exclusions. We recommend the identification of geographic areas where training restrictions would be especially beneficial to environmental resources, such as the Seamounts and other areas with substantial upwelling, and additional discussion of how excluding such an area would affect training goals and the underlying purpose and need. We also recommend that the Navy reconsider its selection of Alternative 2 as its Preferred Alternative as it is the alternative with the greatest impacts to resources and the environment.*	As detailed beginning in Section 5.2.1.6, additional mitigation measures have been considered and in cooperation with NMFS as a cooperating agency. The most effective mitigation measure that still allows Navy to conduct vital training have been proposed. Please see Chapter 5 regarding discussion of each of the additional mitigation measures suggested in your comment. The Preferred Alternative is the alternative that meets all the selection criteria. For these reasons, the Navy believes that issues that would be addressed in adding an alternative along these lines have already been evaluated in different parts of the FEIS/OEIS, specifically in Chapters 2 and 5.

ID	Organization	Public Comment (Written)	Navy Response
EPA Region 10 - 10		**Analysis and Disclosure of Impacts** We are concerned that the some of the potential impacts from project activities are not properly disclosed in the EIS. Conclusions of "no substantial effect" are not always adequately demonstrated and, on some occasions, the lack of knowledge regarding resource impacts seems to be presented as justification for a conclusion of no substantial impact. This approach is frequently in the impacts analysis, and may result in some impacts being underestimated. A possible reason for these deficiencies could be the lack of data or understanding of resources and systems in the GOA.	The Navy considered the best available science in evaluating reasonably foreseeable significant adverse effects on the human environment in this EIS/OEIS. The Navy has taken a hard look through its analysis and has considered competing and contradictory scientific research in supporting its conclusions. Conclusions are justified and do not underestimate impacts. Given particular protective measures, best management practices, standard operating procedures and mitigation measures for Navy's activities, impacts are further reduced when applied. Specifically, this EIS/OEIS identifies methods used, references reliable scientific sources, discusses responsible opposing views, and discloses incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR,1502.9 (b),1502.22,1502.24).
EPA Region 10 - 11		In addition, the EIS tends to assume an even distribution of resources and impacts, which does not accurately reflect the natural distribution of aquatic resources, or the likely nature of distribution and disbursement of impacts. As a result of the approach taken, the EIS seems to have averaged the impacts over the TMAA and concluded that localized impacts would be minimal and temporary, and thus not substantial. This may not be accurate, even in the open ocean.	The estimated density of expended training materials deposited in the TMAA is based on the Navy's experience that its use of other training areas is not uniform (Section 3.2.2.3). The 20 percent use of the TMAA - a conservative "worst-case" assumption - is derived from interviews with Navy personnel. Assumptions are necessary to support quantitative estimates where specific data are not available; the Navy considers this assumption to be reasonable.
EPA Region 10 - 12		The following are specific examples of the above concerns: Water quality impacts. The EIS acknowledges unavoidable effects on ocean and surface water quality, including the introduction of hazardous materials from munitions, yet concludes that no long-term impacts to water resources would occur, and short-term impacts are not addressed.	The potential for releases of hazardous substances from expended training materials is addressed in Expended Materials (Section 3.2.2.1) of the Final EIS/OEIS. The EIS/OEIS acknowledges unavoidable short-term effects on ocean water quality (surface waters were not addressed, as no surface waters will be impacted), but concludes that long-term impacts on water resources would not be substantial. This conclusion is based on a qualitative, item-by-item evaluation of the potential for short-term and long-term releases of toxic or hazardous substances into the environment. Text on the estimated amount of PCBs from SINKEX vessels (about 100 lb per vessel [1999 SINKEX Letter of Agreement]) has been added to Section 3.2.2.6 of the Final EIS/OEIS. Text on the expected leaching rate of copper thiocyanate (0.015 µg/L) from sonobuoys has been added to Section 3.2.1.1.
EPA Region 10 - 13		Sonar impacts on fish. The EIS acknowledges that the "effects of sound on fish are largely unknown" and that there is a "dearth of empirical information on the effects of exposure to sound, let alone sonar, for the vast majority of	The citations abstracted from Section 3.6 must be viewed in context but edits will be made to this important material. The comment is in reference to text on page 3.6-42 which reads, “These experiments did not cause any significant direct

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		fish." However, the EIS documents a study that showed a statistically significant post-exposure mortality of 20 to 30% from simulated Naval sonar signals, and another that found the use of continuous-wave transmissions within the frequency band corresponding to swim bladder resonance will escalate this impact by an order of magnitude, resulting in affects to 0.6 percent of the total stock of juvenile fish. There is no discussion, however, that continuous-wave transmissions at such frequency will not be employed, nor is there discussion of the avoidance measures in response to identification of populations of fish at more vulnerable life stages. The EIS concludes, however, that "limited information currently available suggests that populations of fish are unlikely to be affected by the projected rates and areas of use of military sonar." ***Recommendation*** *We recommend the conclusions drawn in the impact analysis be reevaluated and where impacts are unknown or potentially more substantial, the EIS be revised to reflect this. We also recommend that the assumption of even distribution/disbursement or resources and impacts be reconsidered and revised, if possible, to more accurately reflect the actual spatial and temporal distribution of both.*	mortality among the exposed fish larvae or juveniles, except in two (of a total of 42) experiments on juvenile herring where significant mortality (20 to 30 percent) was observed". Edits will make clear that the sounds used in the experiment were not like U.S. Navy mid-frequency sonar. In the Programmatic Biological Opinion on Keyport and Northwest Training Range Complex dated November 12, 2010, NMFS wrote: Jørgensen et al. (2005) exposed fish larvae and juveniles representing three different species to sounds that were designed to simulate mid-frequency sonar transmissions (1 to 6.5 kHz) to study the effects of the exposure on the survival, development, and behavior of the larvae and juveniles (the study used larvae and juveniles of Atlantic herring, Atlantic cod, saithe (Pollachius virens), and spotted wolfish (Anarhichas minor)). The data from the experiment does not support a causal relationship from sonar exposure and mortality of fish in the study as many fish in the control group died without ever being exposed to sound. As such, a causal relationship was not established.
EPA Region 10 - 14		**Wastewater Discharges** The EIS states that discharges from military vessels are not considered point source discharges under the Clean Water Act but that there are Uniform National Discharge Standards for 25 discharges for military vessels up to 12 nm. Since the EIS only considers activities beyond 12 nm, it is unclear why this information was included, particularly since there is no discussion of what the anticipated wastewater discharges (type and volume) will actually occur. There is also no discussion of the impacts that will result from the wastewater discharges. ***Recommendation*** *EPA recommends that the Final EIS clearly identify any applicable restrictions to wastewater discharges (if any) for the proposed action, the projected types and volumes of discharges, and the anticipated impacts to marine resources from those discharges. We also recommend that the Navy consider additional appropriate mitigation measures to minimize the discharges and subsequent impacts o/those*	The information on the Clean Water Act in Section 3.3.2.2 is not applicable to training in the Gulf of Alaska because training activities occur further than 12 nautical miles from shore. All Navy waste discharges beyond 12 nautical miles would be conducted in accordance with standard operating procedures and best management practices as outlined in OPNAVINST 5090.1C, and as described in Section 3.3.1.2 of the EIS/OEIS. The discussion of wastewater discharges has been removed from Section 3.3.2.2 of the Final EIS/OEIS.

ID	Organization	Public Comment (Written)	Navy Response
		discharges.	
EPA Region 10 - 15		**Impacts from Munitions** The EIS identifies the potential for contamination from munitions components including various heavy metals releases from sonobuoys, leaching of hazardous bomb materials, release of cyanide from torpedoes, various explosives compounds such as aluminum perchlorate, picric acid, etc., and organic chemicals from underwater detonations. The EIS concludes that there would be no long-term or substantial degradation of water resources and no short-term impacts because contaminants would be diluted in the ocean and metal materials would corrode, thus preventing the deterioration of certain objects. We understand the assumption regarding ocean dilution~ however, we believe the assumption should be substantiated with monitoring data, particularly since such activates have been occurring for nearly a decade, and are expected to continue (and possibly increase in frequency and duration) into the foreseeable future. Because of the cumulative impacts to ocean water quality, good stewardship can no longer assume that the size of the ocean will dilute and disperse all pollutants to safe levels, especially considering that metals such as copper and lead bioaccumulate in marine organisms. ***Recommendation*** *We recommend the development and implementation of a monitoring program for the GOA to validate the Navy's conclusions that impacts would not result in long-term degradation of water resources. The Navy should conduct the necessary monitoring to substantiate the assumptions being made regarding the lack of impacts from munitions releases into the ocean environment.*	Please see response to AMCC – 15. Additionally, please note that engineering calculations supported by conservative assumptions demonstrate that the quantities of munitions expended by the Proposed Action would not result in a significant impact on the ocean environment of the Gulf of Alaska. In the absence of a potentially significant impact, monitoring of water or sediment quality would be impracticable due to the vast region covered by the proposed TMAA and the significant depths at which some of the monitoring would need to occur. Regarding bioaccumulation, please see response to CDFU – 9.
EPA Region 10 - 16		**Impacts to Marine Mammals from Mid-frequency Active (MFA) Sonar** We have concerns regarding impacts to marine mammals from MFA sonar in an area that historically has not had MFA sonar activity, or such activity is not disclosed in the EIS. The EIS estimates that the Preferred Alternative will result in a total of 425,551 Level B harassments from active sonar and other non-sonar acoustic sources, and possibly one Level A harassment, affecting all species of marine mammals, including all seven listed species. We are also	The analytical methodology used in the impact assessment for marine mammals was developed in close association with NMFS. The methodology represents the best available and most applicable science with regard to analysis of effects to marine mammals from MFA/HFA sound sources. While recognizing there is incomplete and unavailable information with regard to behavioral impacts on marine mammals, the methodology does look to effects as low as 120 dB SPL specifically to encompass uncertainty and the potential for behavioral reactions in marine mammal species that may be

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		concerned that the impact assessment methodology (derivation of marine mammal density) assumes a uniform distribution of animals although the EIS clearly states that this is "rarely likely true". The EIS recognizes that there are many unknowns in assessing the effects and significance of marine mammal responses to sound exposures but makes no judgment based on the estimated number of harassments as to whether these impacts are anticipated to significantly affect the species. The Council on Environmental Quality (CEQ) Regulations list criteria for assessing significance: the degree to which the effects on the quality of the human environment are likely to be highly controversial, the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks, and the degree to which the action may adversely affect endangered or threatened species (40 CFR 1508.27(4),(5) and (9) respectively). When considered in this light, impacts of MFA sonar on marine mammals may be considered significant under NEPA. We understand the Navy is working with the National Marine Fisheries Service to obtain a Letter of Authorization under the Marine Mammal Protection Act. ***Recommendation*** *We recommend the Navy consider the scientific controversy, uncertain/unknown risks, and presence of threatened and endangered species in assessing significance of impacts from MFA sonar on marine resources. EPA recommends the Navy operate sonar at the lowest practicable level to achieve mandated training levels. We recommend the approach taken for the Hawaii Range Complex be utilized, where an additional alternative was created for the Final EIS that held sonar use at minimal (existing) levels while increasing training activity.*	affected by sounds perceived at levels just above ambient in some areas during some parts of the year in the GOA. The methodology does assume that marine mammals are evenly distributed over the entire area of potential effects. This is a conservative approach since the methodology would over estimate effects given that marine mammals appearing in pods or groups are easier to detect and therefore be avoided by the use of the Navy's standard operating procedures serving as protective measures. The information from the methodology about harassments and takes has been provided to the NMFS for their use in determining the significance of those effects to the various marine mammal populations. After determining the significance, NMFS will issue a Letter of Authorization under the Marine Mammal Protection Act. That LOA will outline what conditions and mitigation measures the Navy will be required to enact, above Navy's existing protective measures. The Hawaii Range Complex (HRC) Final EIS/OEIS did add an alternative in the Final EIS/OEIS that increased training activities but kept the amount of sonar usage to existing levels. Those levels were determined to allow the Navy to meet its future ASW and non-ASW training and RDT&E mission objectives while maintaining historic levels of ASW training to avoid increases in potential effects to marine mammals in the HRC. However, in the GOA TMAA, sonar usage for training has not been done before. Therefore, the Navy could not develop an alternative with existing levels as was done in the HRC EIS. The levels of sonar usage proposed in the GOA EIS/OEIS do represent those minimum levels that are required to allow Navy to meet its ASW training obligations.

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EPA Region 10 - 17		**Mitigation Discussion and Effectiveness** Although the EIS dedicates a full chapter to mitigation, and incorporates mitigation discussion in the impact analysis, there are several instances where the mitigation measure is not clearly identified or defined, and the relevance of the measure to actual impacts is not explained. There are also references to best management practices, Navy policies and standard operating procedures, but specific actions are not always identified, and when they are, no discussion of the anticipated effectiveness of mitigation occurs. It is important that mitigation measures be discussed, especially if they are the basis for concluding that impacts will not be substantial or will not occur at all. Results of monitoring of training impacts would also be helpful to include in mitigation discussions. ***Recommendation*** *EPA recommends further refinement of mitigation measures to include clear identification of the measure (i.e. turtle-free zone), a discussion of the anticipated effectiveness and likelihood of implementation. Monitoring efforts should be included.*	The mitigation measures proposed were developed in cooperation with NMFS. Discussion of the Integrated Comprehensive Monitoring Plan and the GOA specific plan are described beginning at Section 5.2.1.3. Additionally, the Navy believes it mitigation measures are effective and the monitoring reports substantiate this belief. (Please see "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]).
EPA Region 10 - 18		**General Comments** **Discussion regarding SINKEX** The EIS states that the sinking exercise (SINKEX) activities will be "conducted under the auspices of a permit from the USEPA". We recognize that this is a reference to the general permit issued by EPA under the Marine Protection, Research, and Sanctuaries Act (MPRSA) for the SINKEX. However the EIS presents very little information about the requirements and conditions of this permit, or the related August 1999 Letter Agreement between the Navy and EPA. In addition, the EIS refers to the potential for floating non-hazardous expended material to be lost (to become persistent seabed litter) or washed ashore as flotsam. It should be noted that the SINKEX general permit states that "Before sinking, appropriate measures shall be taken by qualified personnel at a Navy or other certified facility to remove to the maximum extent practicable all materials which may degrade the marine environment, including without limitation removing from the hulls other pollutants and all readily detachable material capable of creating debris or contributing to chemical pollution." If the sinking	Please see response to EPA Region 10 – 3.

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		exercise could create floating non-hazardous expended material that will create persistent marine debris or has the potential to wash ashore, the Navy must attempt to remove such material from the marine environment. While disposal of materials during SINKEX is a permitted activity, the EIS should disclose the amount of polychlorinated biphenyls (PCBs) that would be disposed into the ocean under each of the project alternatives. ***Recommendation*** *We recommend that the Final EIS include additional discussion to inform the reader of the conditions with the permit and agreement, including but not limited to: the removal of all PCB transformers and large capacitors; the removal of all small capacitors to the greatest extent practical; removal of readily detachable solid PCB items; the cleaning of petroleum from tanks; piping and reservoirs, as well as the removal of trash, floatable materials, and mercury or fluorocarbon containing materials. The Final EIS should clearly note that the requirements of both the 1999 EPA/Navy agreement and the SINKEX General Permit under 40 CFR 229.2 are to be met in order to comply with the MPRSA SINKEX General Permit. For material that is expected to become flotsam or beach debris, we recommend the consideration of additional mitigation, such as supporting marine debris cleanup efforts in areas potentially affected by such debris.*	
EPA Region 10 - 19		**PM2.5 Designation for Fairbanks** EPA recently finalized its rule to designate portions of the Fairbanks North Star Borough as non-attainment for PM2.5. The EIS currently contains information that is now out-of-date. ***Recommendation*** *We recommend that the Final EIS be updated to reflect the current designation as discussed in the final rule. Please see Final Rule at: http://frwebgate6.access.gpo.gov/cgibinIPDFgate.cgi?WAISdocID=104316123081+4+2+0&W AISaction=retrieve)*	Please see response to EPA Region 10 – 4.
EPA Region 10 - 20		**Evaluation of World War II Dumps in the GOA** During scoping, commenters identified concerns regarding past dumpsites from the World War II era, and requested that the Navy reidentify those and consider them in the analysis.	Past military practices and historical contamination sites are beyond the scope of the EIS/OEIS; they are not associated with the Proposed Action. With regard to the cumulative impacts addressed in Section 4 of the EIS/OEIS, no reliable information on the location, extent,

ID	Organization	Public Comment (Written)	Navy Response
		There does not appear to be any discussion regarding these sites in the document outside of the scoping summary. ***Recommendation*** *While specific information relating to the existence, location and possible constituents of past marine dump sites may not be readily available, we recommend that any reliable information (e.g. information from the marine charts referenced by the commenter) currently available be reviewed and any conclusions, even general, regarding these sites be included in the cumulative impacts assessment in the Final EIS, if possible.*	or contents of World War II military dump sites in the GOA have been identified.
EPA Region 10 - 21		**Programmatic Nature of EIS** Although the document is not currently identified as a Programmatic EIS, it does appear that the EIS is programmatic in nature as it identifies, for an unknown period of time, activities that could occur within a specified range in magnitude, scale, and timeframe. As such, it may beneficial for the Navy to identify the document as programmatic and also set an estimated timeframe for which these activities are anticipated to occur (i.e. 5 or 10 years) before reevaluation, regardless of changes to the activities. We believe that reevaluation at regular intervals is important given the complexity of the marine dynamics as well as the substantial changes being observed in the GOA. ***Recommendation*** *We recommend that the Navy consider identifying the document as a Programmatic EIS and determine a timeframe for reevaluation.*	Navy training is a continuous and ongoing action that varies and shifts with time to meet training needs. The Navy has taken a comprehensive approach in developing environmental compliance documents for our ranges and operating areas, including GOA. The GOA EIS/OEIS is evaluating Navy activities in the GOA TMAA for which the Navy will be conducting mitigation and monitoring on an annual basis, under the terms and conditions of both the ESA Incidental Take Statement and the MMPA Letter of Authorization. Navy training activities in the GOA TMAA will be continuously evaluated on a five-year basis to support the timeframe of the ESA and MMPA authorizations. After this time, the Navy will undertake additional NEPA analysis and related/necessary regulatory actions to continue Navy training in the TMAA. This EIS/OEIS is serving as both the Navy's NEPA compliance document for training activities in the GOA and also the NMFS decision to issue a Letter of Authorization permit.
EPA Region 10 - 22		**Consideration of MPRSA** The MPRSA is not currently listed in several lists or discussions of environmental laws applicable to this project, even though it is quite relevant to the SINKEX activities. ***Recommendation*** *We recommend including the MPRSA in lists and discussions of environmental laws throughout the document where appropriate.*	The Marine Protection, Research, and Sanctuaries Act of 1972 is addressed in Section 3.2.2.2, Expended Materials, and Section 3.3.2.2, Water Resources. The identified sections also include descriptions of the SINKEX general permit under MPRSA. While not explicitly identified in other sections of the EIS/OEIS, MPRSA is indirectly referenced when resources sections refer to hazardous material or water quality analysis provided in Section 3.2 or 3.3, respectively.
EPA Region 10 - 23		**ENCLOSURE 2** **U.S. Environmental Protection Agency Rating System for Draft Environmental Impact Statements Definitions and Follow·Up Action*** **Environmental Impact of the Action**	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		LO - Lack of Objections The U.S. Environmental Protection Agency (EPA) review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal. **EC - Environmental Concerns** EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce these impacts. **EO - Environmental Objections** EPA review has identified significant environmental impacts that should be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no-action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts. **EU - Environmentally Unsatisfactory** EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of public health or welfare or environmental quality. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ). • From EPA Manual 1640 Policy and Procedures for the Review of Federal Actions Impacting the Environment. February, 1987.	
EPA Region 10 - 24		**Adequacy of the Impact Statement** **Category 1 – Adequate** EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis of data collection is necessary, but the reviewer may suggest the addition of clarifying language or information. **Category 2 - Insufficient Information**	This comment is duly noted.

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		The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses or discussion should be included in the final EIS. **Category 3 – Inadequate** EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the National Environmental Policy Act and or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.	
Eye of the Whale Olga von Ziegesar - 1		My name is Olga von Ziegesar. I am the director of Eye of the Whale, a nonprofit research group here in Alaska. Our mission is to study and protect the humpback whale, and to educate people of the status and health of the species. We have been documenting the population of the humpback whales of Prince William Sound and the North Gulf coast of Alaska for thirty years. In 1966 the humpback whale was put on the Endangered species list and was protected by the Marine Mammal Protection Act. In the thirty years of my study I have seen the population of the north Pacific humpback whale go from 3000 to 20,000 whales. About five thousand of these migrate up into the North Gulf of Alaska to feed. This area includes the Cook Inlet, Kodiak, the Barren Islands, Kenai Fiords, Prince William Sound, and the waters in-between.	This comment is duly noted.

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Eye of the Whale Olga von Ziegesar - 2		It is known that military sonar testing is very damaging to the soft tissue in marine mammals' skulls and organs. These affects can cause brain hemorrhages, mass stranding, and even death. Mid frequency sonar has been proved to be very disruptive to whale diving and feeding behavior. They will avoid the intense sounds by surfacing too quickly and causing conditions similar to the "bends".	For acoustic exposures to result in injury to marine mammals, the sound source has to be very loud and the animal very close (within a few meters) for there to be a direct effect. Mass strandings of whales have occurred as described in Appendix F, however, this occurrence is relatively rare and the reasons it has occasionally happening are therefore not well understood. The Navy has been using mid-frequency and high-frequency active sonar for decades in the Fleet concentration areas of the East Coast, Southern California, and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations as documented in monitoring reports at these training ranges (see “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). The Navy’s analysis and history demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Eye of the Whale Olga von Ziegesar - 3		You may think that these Military tests would be harmless if they are done in the winter, and not during summer months when the whales are most abundant. We are now finding that many whales stay in Northern waters during the winter to continue their feeding. Hydrophone arrays hung from buoys in the Gulf of Alaska have recorded whale songs and calls during all months of the year.	Please see Section 3.8 of the EIS/OEIS regarding presentation of this same information.
Eye of the Whale Olga von Ziegesar - 4		You will say that your plan is to have observers aboard to watch for whales, and when they are present the testing will be ceased. Marine mammals can hear for many miles under water. From the deck of a ship a whale blow can only be seen if it is within a couple of miles. For these reasons, it will be impossible to avoid affecting the whales, and other marine mammals during any time of the year in the Gulf of Alaska.	Please see response to Greg Brown – 8.
Eye of the Whale Olga von Ziegesar - 5		Finally the humpback whale population is recovering to healthy numbers and now the Navy proposes to endanger them with intensive sonar and explosives. It seems to me that we must change something if protecting our country means sacrificing the whales.	The Navy has been conducting these same training events including the use of sonar for decades in the Hawaiian Islands including within the Humpback Whale National Marine Sanctuary with no apparent affects on the recovery of humpback whales. As presented in Section 3.8, Navy does not anticipate any population level affect on humpback whale in the Gulf of Alaska from Navy training activities.

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Eye of the Whale Shelley Gill - 1		My name is Shelley Gill and I work for Eye of the Whale, a nonprofit research group here in Alaska. Our mission is to study and protect the humpback whale, and to educate people on the status and health of the species. We have been documenting the population of humpbacks along the north Gulf of Alaska coast for thirty years. In 1966 the humpback was placed on the endangered species list and was protected by the Marine Mammal Protection act. It has taken thirty years but the humpback has finally begun to make a comeback and we now estimate a population of about 20,000 whales. About 5000 of those migrate up into the North Gulf of Alaska to feed. They congregate, with their calves, along the shelf where the Navy proposes to do this testing. The area includes the Cook Inlet, Kodiak, the Barren Islands, Kenai Fiords, Prince William Sound and the waters in between. In the last five years, in this same area, scientists have made the first sightings of Blue Whales, a species not seen in Alaska since the 1940's. They appear to be re-establishing migration patterns disrupted by 1920's whaling that nearly led to the extinction of the species. Because of a change in herring stocks and feeding patterns we have documented a large exodus of humpback whale from interior water to the outside Gulf coast. Prince William Sound an the adjacent areas are beginning-just beginning-to recover from the devastating Exxon Valdez Oil Spill 20 years ago. We watched as Stellar sea lion populations plummeted and they are now on the endangered species list.	This comment is duly noted. Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Additionally, please note that Humpback, blue whales and stellar sea lions have been carefully considered in Section 3.8 of the FEIS/OEIS and were included in the acoustic modeling analysis. The Exxon Valdez oil spill was addressed within the affected environmental baseline descriptions of the GOA area.
Eye of the Whale Shelley Gill - 2		It is important to note that any form of sonar can adversely affect not only whales but all marine mammals; sea otters, seals and sea lions. It is well documented that sonar testing is extremely damaging to the soft tissue in marine mammals' skulls and organs. It causes brain hemorrhages, mass strandings, even death. Mid frequency sonar is very disruptive to whale diving and feeding behavior as well. Whales will avoid the intense sounds by surfacing too quickly. This causes a condition similar to the bends.	Please see Section 3.8 regarding the analysis of affects to marine mammals from the proposed use of mid and high frequency sonar during Navy training activities. With regard to the injuries and strandings, please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report.
Eye of the Whale Shelley Gill - 3		Further, through explosive testing a number of toxins will be released into the water. The impacts are unknown. Your proposed "training exercise" has the potential to set back PWS recovery, disrupt commercial and sport fishing along the offshore shelf and poses a real threat to whale populations.	Please note that as depicted in Figure 1-1, Prince William Sound (PWS) is over 50 miles from the nearest corner of the TMAA where the proposed training activities will occur. Socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. To help manage competing

ID	Organization	Public Comment (Written)	Navy Response
			demands and maintain public access in the GOA, the Navy conducts its offshore activities in a manner that minimizes impacts to commercial fishing.
Eye of the Whale Shelley Gill - 4		After reviewing the plan of action for activity when whales are present, the Navy should be aware that is totally irresponsible and demonstrates their ignorance regarding cetacean behavior and physiology. You state you will have spotters who will alert the bridge when there are whales present and when they are present the testing will be ceased. Marine mammals can hear for many miles under water. Blue whales echolocate across 1000 miles of sea. However, from the deck of a ship, a whale blow can only be spotted if it is within a couple of miles. For these reasons, it will be impossible to avoid adversely affecting the whales and other marine mammals during any time of the year in the Gulf of Alaska.	Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. In addition, NMFS-approved Marine Species Awareness Training is required before every sonar exercise. While the Navy is very confident in its well-trained lookouts, it does not expect that 100% of the animals present in the vicinity of training events will be detected. As such, the Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The suite of mitigation measures proposed by Navy, developed in coordination with NMFS, and presented in Chapter 5 provides the best balance between the need to be precautionary in the protection of marine mammals and the needs to realistically train at sea.. Please refer to Chapter 5 of the EIS/OEIS which presents the U.S. Navy's protective measures in addition to visual detection from ships (such as passive detection of vocalizations, observations from available aircraft), outlining steps that would be implemented to protect marine mammals and Federally listed species during training events.

ID	Organization	Public Comment (Written)	Navy Response
Eye of the Whale Shelley Gill - 5		Last year Prince William Sound fishermen experienced one of the worst fishing years in history. In these uncertain economic times it was a severe blow to our economy. Scientists are struggling to figure out what is going on in PWS and adjacent waters. Water temperature increases due to global warming are a real factor. Ocean acidity, lack of food stocks; all these elements play a role. At this point having the Navy off the coast setting off explosions and testing mid range sonar for a training exercise on the fishing grounds is a pressure the area cannot handle. Sincerely, Shelley Gill Eye of the Whale	As depicted in Figure 1-1, Prince William Sound (PWS) is over 50 miles from the nearest corner of the TMAA where the proposed training activities will occur. As detailed in Section 3.6, the use of explosives may result in injury or mortality to individual fish but would not result in impacts to fish populations. Because only a few species of fish may be able to hear the mid and high frequency sonar, the training events employing their use would result in minimal harm to fish and only minimal and temporary impacts to Essential Fish Habitat.
Nina Faust & Edgar Bailey - 1		Comments RE: Gulf of Alaska Navy Training Activities EIS/OEIS Dear Sirs, We are appalled at the proposal to expand Navy Training Activities in the Gulf of Alaska. The fact that the Navy even does any training exercises in the spring and summer in this richly biodiverse area when many whale species are migrating north and other species are spawning or giving birth, is biologically insensitive and ecologically adverse. We are strongly opposed to any proposals to expand these operations in the Gulf of Alaska.	This comment is duly noted.
Nina Faust & Edgar Bailey - 2		Alaska has a long history of toxic military waste that has recently come to light. Some of this waste will affect Alaskan waters for a long time to come. The Navy's proposal to increase ocean pollution here with the enormous addition of expended hazardous material is unconscionable, especially considering the dependency of Alaskans on salmon, crab, pollock, cod and other important seafood harvested by our fishing fleets.	Please see response to AMCC – 15. Additionally, please note that initial releases and peak concentrations of hazardous materials from expended materials would not result in water or sediment toxicity. Hazardous materials would be quickly dispersed by ocean currents to non-toxic concentrations, and would not be expected to adversely affect marine organisms.
Nina Faust & Edgar Bailey - 3		Adding the proposed toxins from exploded ordinances threatens Alaska's clean water and fishery resources. Considering the mess left by the bombing range at the mouth of Eagle River, we know all too well how toxic exploded ordinances are.	The effects of ordnance use during seasonal training exercises over water in the GOA are not comparable to those of long-term use of a land range. Only a small portion of the expended training materials, by weight, would be explosives, and all but trace quantities of explosives byproducts would be consumed during their use (detonation); high-order detonations are approximately 99.997% efficient in converting explosives to non-hazardous inorganic compounds (see Page 3.2-2 of the EIS/OEIS). These trace quantities of byproducts would be quickly dispersed. Byproducts of live ordnance are addressed in Section 3.2 of the EIS/OEIS.

ID	Organization	Public Comment (Written)	Navy Response
Nina Faust & Edgar Bailey - 4		The sonar testing is of grave concern to the marine mammals in Gulf of Alaska waters. It is well known and well documented that sonar can disrupt marine mammals and even kill them. The Navy knows the research.	Please see Appendix F regarding the potential stranding of marine mammals associated with sonar use and Section 3.8 regarding the potential effects on marine mammals. As the analysis presented in Section 3.8 indicates, the use of sonar is not predicted to result in any injury or death to any marine mammals based on the best available science. Also see Chapter 5 for a presentation of the mitigation measures developed in coordination with National Marine Fisheries Service to reduce risk to marine mammals from sonar use.
Nina Faust & Edgar Bailey - 5		We oppose the active sonar training proposals due to the very sensitive populations of marine mammals. populations of sea otters and sea lions have fallen dramatically in the past decade, threatening their viability. Adding the stress of sonar testing to populations that are already in trouble should not be allowed.	Your comment is noted, however, as detailed in Section 3.8 on environmental consequences, the analysis indicates there should be no impacts to populations of marine mammals including sea otters and sea lions.
Nina Faust & Edgar Bailey - 6		We do not support the proposed alternatives in the EIS/OEIS. At the very least, the exercises should stay status quo. At the best, we would like to see a cease and desist of all of these exercised in these very important marine mammal and fishery areas.	This comment is duly noted.
Nina Faust & Edgar Bailey - 7		The cumulative effects of the added stresses the Navy is proposing may be the too much for already stressed marine mammal populations. In Alaska, our wild resources are important for our security and that should be respected. Sincerely, Nina Faust - Edgar Bailey.	The cumulative impacts analysis addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. Table 4-1, in the Final EIS/OEIS, succinctly depicts the categories of past, present, and reasonably foreseeable future actions that have an effect on cetacean populations. The FEIS/OEIS analyzes and compares the effects of Navy actions on specific resources in detail, and places those in the context of other sources of impacts. With regard to marine mammals, the cumulative impacts analysis accurately concludes that Navy activities, while they may affect marine mammal species, will not present significant impacts.
Carolyn Heitman - 1		Enclosed are additional comments on the GOA Draft EIS/OEIS to be included with my oral comments on January 7, 2010. I found the DEIS to be completely inadequate and lacking in the Navy's analysis of mid-frequency active sonar impacts to humans, fish and marine life (endangered North Pacific right whales e.g.) in, or near the GOA TMAA- including inland/overland areas which could potentially be affected by the Navy, Air Force and Army joint training exercises.	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
Carolyn Heitman - 2		The Navy seems to be focusing mainly on mid-frequency active sonar use in the DEIS, but there are other sonar frequencies that could be just as hazardous to marine life (and humans), such as low-frequency (LF) and extremely - low frequency (ELF) transmissions, which the Navy uses on a regular basis in various areas. If the Navy is also proposing the use of LF and ELF in the GOA TMAA or over land area, that information needs to be included in the FEIS along with the hazardous transmission effects on marine life-mammals and humans.	The Navy is not proposing to use low-frequency or extremely low-frequency transmissions during its training activities in the TMAA.
Carolyn Heitman - 3		Also, it states in the DEIS that the Navy does not know the hazards to birds from mid-frequency active sonar at long ranges.	Section 3.9 of the EIS/OEIS provides a thorough analysis of potential impacts to seabirds. Best available science was considered in the analysis of potential impacts to seabirds. The analysis concluded that the Navy's activities would have no significant impacts to seabirds.
Carolyn Heitman - 4		What about the risks to humans from long range MFA sonar? Taking into consideration all of the scientific research and studies that have been done by Navy scientists and others, I suspect the hazards are known but the Navy did not want to list them in the DEIS. The hazards to humans, birds, mammals and sea life needs to be included in the DEIS/OEIS.	Sonar effects on humans are described in Section 3.14.2.4 in the Public Safety section of the EIS/OEIS, while sonar effects for the listed biological resources listed in the comment are addressed in the individual resource sections of the EIS/OEIS. Potential impacts of sonar on humans were discussed in Section 3.14.2.4 and determined to only be possible when humans are underwater and close to the sonar source. Due to the infrequency of diving activities in the TMAA and the location of training activities (over 12 nautical miles from the closest land mass), impacts on humans are not likely.
Carolyn Heitman - 5		The GOA DEIS is mainly focused on the use of mid-frequency active sonar and some evaluations and information was omitted in the draft which should have been included for public comment. Section 3.14-Public Safety and Section 3.14-7-Aircraft Overflights in the GOA DEIS very briefly mentions potential risks to the public from ship or aircraft electromagnetic transmissions.	Radar used during training activities would follow Standard Operating Procedures (SOPs) to ensure both public and Navy personnel safety. Radar and other electromagnetic sources on Navy vessels have their highest intensities at the source; the strengths of these electromagnetic fields decrease at a geometric rate with increasing distance from the source. These sources also are elevated substantially above the surface of the ocean. Thus, non-Navy vessels operating at a safe navigational distance from Navy vessels would not be at risk from electromagnetic sources.
Carolyn Heitman - 6		However, in a October 22, 2008 Elmendorf Air Force Alaska briefing by Major Rob Peck, Airspace & Range Operations Team Chief, 611 AGC Combat Operations Division, he stated that the GOA EIS is mainly a subsurface evaluation and that although the Navy was looking at airspace, there would be no airspace proposal or rulemaking associated	Navy training in the TMAA would use existing designated airspace and general use airspace that has already received environmental analyses in Air Force and Army NEPA documents. Additionally, according to the FAA, no permanent airspace needs to be established as part of the Proposed Action. A more detailed discussion on the effects of the

ID	Organization	Public Comment (Written)	Navy Response
		with the EIS. Why was an airspace evaluation not done for warfare training exercises?	Proposed Action on air traffic is described in Section 3.11; Transportation.
Carolyn Heitman - 7		I am requesting that a Supplemental GOA DEIS be done as soon as possible, so that the public has time to comment on it, even if it means a delay in releasing the FEIS. Since the Navy, Air Force and Army are cooperating and doing combat training exercises together in the GOA and elsewhere in Alaska, the Supplemental GOA DEIS should include all air training exercise locations, military training routes (MTR), including the two new ones which are being proposed to be added this year, all radars/sensors which will participating in future combat exercises in or near the GOA or over-land areas, including their transmission, frequency and power levels. Some examples: (a) Sea-based X-band radar (b) Cordova HAARP substation (c) Juneau ANtrPY-2 (Transportable Xband Radar) (d) Shemya radar (e) HAARP in Gakona (f) Kodiak Dual-use High-power Microwave (g) King Salmon Microwave (h)Airborne Laser Plane. Some of these sensors/radars have transmission power levels which pose a health risk to humans and animals alike.	The focus of this EIS/OEIS is Navy training in the TMAA – to the extent that the Navy uses Army and Air Force ranges, those ranges and Navy activities that occur on them are incorporated by reference. Please see Section 1.6.
Carolyn Heitman - 8		The Sea-based X-Band will be coming under the jurisdiction of the Navy later this year (MDA spokesman Richard Lehner) and if the Navy is proposing to bring the radar to Alaska for home-porting or participate in future GOA training exercises, this information also needs to be included in a GOA Supplemental DEIS as the radar's transmission power levels are extremely hazardous to humans, birds and wildlife.	The Sea-based X-Band radar and its operation is not part of this Proposed Action and therefore is not addressed in the EIS/OEIS. Additionally, the X-Band radar has already been evaluated separately for homeporting by the Missile Defense Agency.
Carolyn Heitman - 9		The Navy assumes there will be no significant impacts to any marine life in the GOA TMAA but has no documentation in the DEIS to back up its conclusion.	Please see Sections 3.2, 3.5 through 3.9, Chapter 4 (Cumulative Impacts), and Chapter 5 (Mitigation Measures) of the FEIS/OEIS, which shows that the Navy has done a comprehensive analysis of the effects of the proposed activities.
Carolyn Heitman - 10		Very relevant 2009 Navy and Air Force documentation which should have been referenced and included in the GOA DEIS for public comments but is lacking, is the May 2009 'Northern Edge Joint Training Exercise 2009' Final EA/OEA (Elmendorf Air Force document) and the Naval Postgraduate School funded 'Cruise Report for the April 2009 Gulf of Alaska Line-Transect Survey (GOALS) in the Navy Training Exercise Area' (June 2009), in which scientists (including some Navy), on the NOAA ship Oscar	NE09 EA/OEA was prepared by the Navy, COMPACFLT was the action proponent. This document, looking programmatically at this training, includes all aspects of the NE09 EA and is broader. The Navy funded the GOALS survey to address the data needs for additional information on marine mammals." This document is referenced as Rone et al. 2009 in FEIS/OEIS.

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		Dyson documented marine mammal species and biological resources that would be potentially affected by Navy GOA training exercises.	
Carolyn Heitman - 11		Information contained in the Elmendorf Air Force document, determined that there are 37 Endangered Species Act (ESA)-listed species that potentially occur within or near the GOA Exercise Area, including 28 fish species and 7 marine mammals.	The EIS/OEIS contains accurate information regarding the presence of marine mammals and other endangered species within the TMAA as developed through consultation with NMFS as a cooperating agency on this document.
Carolyn Heitman - 12		Section 3.4.1.2.3-Conclusions on Effects of Sound on Fish in the Elmendorf AF document stated: "The data obtained to date on effects of sound on fish are very limited both in terms of number of well-controlled studies and in number of species tested. Moreover, there are significant limits in the range of data available for any particular type of sound source. Finally, most of the data currently available has little to do with actual behavior of fish in response to sound in their normal environment. There is also almost nothing known about stress effects of any kind(s) of sound on fish." The document also states that aside from a few field studies, there are no data on the most critical questions regarding behavior effects of fish and that the more critical issue is the effect of human generated sound on the behavior of wild animals.	These statements in the comment are correct and the best available science has been considered in preparation of this EIS. Most sounds generated as a result of Navy activities, however, will have no effect (such as mid- and high- frequency sonar which most fish cannot hear) or limited temporary effect (such as ship radiated noise from a passing vessel). Please see response to Greg Brown – 3.
Carolyn Heitman - 13		The Navy concedes in the GOA DEIS/OEIS that the effects on fish could include direct physical injury including potential death from mid-frequency active sonar,	The FEIS/OEIS does not conclude or state that the proposed sonar use could result in death or injury to fish species in the GOA. All indications are that most fish cannot hear the Navy's mid- and high-frequency sonar proposed for use in the TMAA. Effects of sonar on marine fish are described in Section 3.6, Fish.
Carolyn Heitman - 14		and since the GOA is a major commercial fishing area, the Navy, Air Force and Army should refrain from using mid-frequency active sonar or any other sonar (LFA, ELF) which has potential to kill fish, marine life or animals, and it should go without saying--the potential risks to humans.	The Navy is not proposing to use low-frequency or extremely low-frequency sonar during its training activities in the TMAA. As part of the general discussion of sonar in the EIS/OEIS, effects of LFA sonar were included in Section 3.6.2.4 of the EIS/OEIS.
Carolyn Heitman - 15		Low Frequency Active (LFA) sonar has also been known to kill fish.	As stated above, LFA sonar is not part of the Proposed Action.
Carolyn Heitman - 16		What exactly are the Navy's Shutdown Procedures for Schools of Fish in the GOA? That is, if Schools of Fish can be detected at all.	There are no mitigation measures involving shutdown procedures for schools of fish. As discussed in Section 3.6.2, it is not likely that Navy activities will impact any large numbers of fish in the GOA.

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Carolyn Heitman - 17		Another concern of the Navy's use of MFA sonar (or LFA sonar) is the fact that more than 95% of the seabirds breeding in the Continental United States nest in colonies in the Gulf of Alaska and Bering and Chukchi Seas (1992 US Fish and Wildlife Service). Approximately 60 million birds of 40 species breed in the Gulf of Alaska. Plus another 50 million visit the area during the summer. According to the U.S. Geological Survey Department, some seabird populations damaged by the EXXON Valdez oil spill have not recovered. In fact, as a whole, the Gulf of Alaska has not recovered from the oil spill. It is unacceptable and unnecessary for the Navy to put further contaminations in the GOA waters and stressors on marine life and birds.	The proposed action within the TMAA will not impact nesting or breeding areas on land. The TMAA is many miles distant from and does not include Prince William Sound where the Exxon spill occurred. Effects of Navy training activities in the TMAA on birds are described in Section 3.9. Cumulative Effects on birds are described in Section 4.2.9. In addition, Chapter 22 of OPNAVINST 5090.1C provides specific guidance on how Navy vessels underway must handle oil and oily wastes (Section 22-5 of OPNAV INST 5090.1C), hazardous materials (Section 22-6), solid wastes (Section 22-7) and medical wastes (Section 22-8). Additionally, Section 22-9 of OPNAVINST 5090.1C provides very specific guidance on the requirements for preparing for and dealing with any oil or hazardous substance spills.
Carolyn Heitman - 18		The Navy's GOA TMMA boundary line extends beyond the Aleutian Trench. The DEIS did not address what activities would take place in the trench or sonar impacts to sea life living in the trench, so this information needs to be included in the PEIS.	Activities proposed within the TMAA have the potential to occur over the Aleutian Trench. Sound energy from sonar may be present within the trench on occasion. However, the probability of effect is uniform across the entire TMAA. The potential effects to resources are analyzed as a whole and effects to the trench are reflected in potential effects to the entire TMAA.
Carolyn Heitman - 19		From the information given in the DEIS, there are no environmental benefits from GOA warfare testing. Rather the opposite is true-- the Navy's presence and activities pose potential environmental risks, especially to the endangered and threatened species found in or along the Gulf of Alaska coastline.	As detailed in Chapter 2, none of the proposed Navy training activities involve "testing." As analyzed in detail in Chapter 3 of the EIS/OEIS, Navy activities would not result in significant impacts to threatened or endangered marine species or seabirds located in the shallow and inner waters of the Gulf of Alaska as defined under NEPA.
Carolyn Heitman - 20		These species have no tolerance for additional risks factors. The Navy has not proven that it can ensure the protection of marine mammals, marine life and birds in the GOA.	The analysis in the EIS/OEIS documents the potential impacts and the likely results of those impacts on ESA listed species within the TMAA. The National Marine Fisheries Service will provide a Biological Opinion regarding their assessment of any risk to endangered or threatened species under their purview. Chapter 5.0 of the EIS/OEIS, Mitigation Measures, presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. The Navy's protective measures are effective at mitigating, not eliminating, all risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant

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			biological impact to marine mammals and other species at those locations, it is not likely that any additional risk posed by the proposed activities will have any significant impact on species in the TMAA.
Carolyn Heitman - 21		Nor can it guarantee the safety to humans from mid-frequency transmissions.	The Navy Standard Operating Procedures for human safety during sonar use are described in Section 3.14.1.2 in the Public Safety section of the EIS/OEIS. Navy training exercises in the GOA would take place over 12 nautical miles offshore, where no recreational activities, including diving, would be expected to take place. Sonar would only affect humans in the water, and would not affect humans on vessels even when within the portion of the vessel under the surface of the ocean.. Navy mitigation measures would ensure that non-participants would be a sufficient distance from the sound source before using active sonar. Sonar systems used in Navy training activities in the GOA are described in Section 2.5.2.1.
Carolyn Heitman - 22		According to a 2008 National Oceanic and Atmospheric Association (NOAA) report, increasing evidence suggests that exposure to intense underwater sound in some settings may cause certain marine mammals to strand and ultimately die. Some of these strandings are associated with mid-frequency active (MFA) military sonar."	Appendix F provides a thorough discussion of the information linking strandings to the use of mid-frequency sonar. As the citation indicates, there have been strandings associated in time and location with the use of mid-frequency sonar but these events are rare in comparison to the number of times sonar has been used over the last 40 years. The Navy will continue to be a leader in funding marine mammal research to better understand marine species and to be able to operate with the least possible impacts.
Carolyn Heitman - 23		According to recently released NATO documents, low frequency active (LFA) sonar has been used as high as 240 decibels, which is considered to be millions of times higher than the level that causes damage to humans and animals. The Navy has tested its LFA sonar on divers in the 120 to 160 decibel range, which resulted in hospitalization of the subjects. The Navy has experimented with its sonar on humpback and blue whales around Hawaii and the above levels are enough to cause permanent damage and death even for short periods of exposure.	The Navy is not proposing to use low-frequency sonar during its training activities in the TMAA. As part of the general discussion of sonar in the EIS/OEIS, effects of LFA sonar were included in Section 3.6.2.4 of the EIS/OEIS. Navy experiments in Hawaii that you mention in your comment are referenced in the SURTASS LFA EIS document which can be found at http://www.surtass-lfa-eis.com/. The conclusions in the document indicated that “The potential effects from SURTASS LFA sonar operations on any stock of marine mammals from injury (non-auditory or permanent loss of hearing) are considered negligible, and the potential effects on the stock of any marine mammal from temporary loss of hearing or behavioral change (significant change in a biologically important behavior) are considered minimal. Any auditory masking in marine mammals due to SURTASS LFA sonar signal transmissions is not expected to be severe and would be temporary.”

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Carolyn Heitman - 24		In Navy training exercises off the Bahamas, low frequency sonar levels of up to 235 decibels was used. Decibels in the 120 to 150 range caused the whales to abandon the area. In June 2004, six beaked whales stranded in Alaska after active sonar testing during the Navy's Northern Edge exercises in the GOA. Information is limited on this event and did not come from NOAA or the Navy but from legal discovery. Whether or not it had anything to with the Navy's 2009 summer Northern Edge Exercises in the GOA, a 2-year old humpback whale carcass was found washed ashore on a Kodiak Island beach on August 19. It was presumed to have been dead for approximately 4 weeks, but it's possible it could have been longer. Coincidentally, Northern Edge Exercise in the GOA took place from June 15-27.	The Bahamas event is discussed in detail in Section F.1.6.1 of Appendix F of the EIS/OEIS. Please note, there was no low frequency sonar used by Navy in the Bahamas prior to the March 200 event we believe you are referring to. Analysis of the distribution of beaked whales in the Bahamas following that event has been inconclusive, however, Navy has undertaken Behavioral Response Studies involving beaked whales to better understand sonar impacts on these marine mammals. With regard to the strandings of beaked whales between 27 June and 19 July 2004, please see the discussion in section 3.8.4.1 on Impacts of Human Activity and Appendix F. There have been no ASW exercises involving use of mid-frequency sonar in previous Northern Edge Exercises (incl. 2004/09). The strandings in GOA in 2004 were not associated with the use of Navy mid-frequency sonar since no sonar training events occurred, the animals were spread over 1,600 miles of coastline, and were found 27 June and 19 July. While there have been strandings associated in time and location with the use of mid-frequency sonar outside of GOA, these events are rare in comparison to the number of times sonar has been used over the last 40 years.
Carolyn Heitman - 25		The ‘Red Flag Alaska' exercise jamming frequencies) was going on from July 27-August 7. If there were any over flight exercises near the GOA, certain air activity using various transmission frequencies may also have interfered with the whale, as some transmissions can reach long distances.	Because most radio and other electronic devices that may be "jammed" are in the portion of the frequency spectrum very far above the hearing of whales and the radio waves do not propagate from the air into the water, whales will not be able to hear any of those transmissions.
Carolyn Heitman - 26		Section 3.6.1.3-Subsistence in the previously noted Elmendorf AF 'Northern Edge Training Exercise' document, it states that a number of communities that could potentially be affected by air activities are either partly or entirely dependent on subsistence activities and that because of the dependence of many Alaskans on subsistence activities, low-level military overflights and their potential impact on wildlife are a particular concern. Since there was no detailed information given in the GOA DEIS/OEIS, exactly what communities (coastal or inland) has the potential to be affected by air or ship warfare activities? List them in the FEIS.	The referenced document was making note of a recognized concern involving low-level overflight by aircraft, not indicating low-level flight would occur. No low-level overflights of land or coastal areas are associated with the Proposed Action. All the proposed overflights would take place above 15,000 feet and only occur during joint training exercises. Furthermore, the proposed action uses existing airspace over land areas and the use of that airspace was analyzed in other NEPA documents incorporated by reference and listed in Section 1.6 in the FEIS/OEIS. Additionally, regarding subsistence activities, the Navy has made extensive efforts to coordinate and consult with Native Alaskan tribes (please see Appendix C).
Carolyn Heitman - 27		As of January 5, 2009 (Federal Register), the National Marine Fisheries Service is adjusting the total allowable	As detailed in Section 3.8.3.7, the TMAA is outside the established Critical Habitat boundary for the Steller sea lion,

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		catch (TAC) amounts for the Gulf of Alaska Pollock and Pacific Cod fisheries. (Fisheries of the Exclusive Economic Zone of Alaska; Inseason Adjustment to the 2009 Gulf of Alaska Pollock and Pacific cod Total Allowable Catch Amounts.) The reason for this adjustment is because the endangered Steller sea lions occur in the same location as the Pollock and cod fisheries and cod and Pollock are the primary prey species source for the Steller sea lions in the GOA. The seasonal apportionment of Pollock and Pacific cod harvest is necessary to ensure the ground fish fisheries are not likely to cause jeopardy of extinction or adverse modification of critical habitat for Steller sea lions. This decision by NMFS will no doubt affect commercial fishermen in the GOA but is necessary to help with the Steller sea lions survival.	which was established to incorporate the forage range of the Steller sea lion plus a buffer. As presented in Section 3.6, some Navy activities may impact individual fish in the TMAA but will not affect fish populations in the TMAA.
Carolyn Heitman - 28		Additionally, Steller sea lions lives are being jeopardized by Killer whales in the Eastern GOA (Alaska Sea Life Conservation Science Center). If restrictions are being placed on Alaska fishermen, it is only fair that restrictions also be placed on the Navy, Air Force and Army by not allowing any warfare training exercises in the Gulf of Alaska.	Restrictions are placed on Navy training activities in the form of mitigation and protective measures for training activities as detailed in Chapter 5 of the EIS/OEIS.
Carolyn Heitman - 29		The Navy has other long-time training areas such as Point Mugu off the California coast and does not need to continually impact other environmentally sensitive areas for training exercises; nor should the Navy be doing military exercises that are likely to cause jeopardy of extinction or adverse modification of critical habitat for Steller sea lions or any other endangered species.	As discussed in Chapter 2, Section 2.3.2.1 of the FEIS, the GOA TMAA provides a strategically important and unique venue for conducting required Navy training activities and meeting the mission of Alaskan Command. As analyzed in detail in Chapter 3 of the EIS/OEIS, Navy activities would not result in significant impacts to threatened or endangered marine species or seabirds located in Gulf of Alaska. The Navy has completed the appropriate level of consultation with NMFS and USFWS for their proposed activities in GOA.
Carolyn Heitman - 30		The Navy has already received a Permit of Authorization from National Marine Fisheries Service (NMFS) to incidentally take 2 million marine mammals per year for the next 5 years during its training exercises in Hawaii, the West Coast, Gulf of Mexico and the entire East Coast. Currently the Navy is proposing to do training exercises off of Guam. According to Sheila Murray, Navy Public Relations Officer, the Navy already is conducting warfare testing programs in various U.S. locations and within the last two years has issued almost identical environmental impact statements for Warfare Training Range Complexes in the Mariana Islands,	The Navy's proposed action is for training activities and not warfare testing within the GOA. The Navy has been conducting training events in the Gulf of Alaska for over two decades and the GOA is a location meeting the requirements necessary for realistic training. Specifically, the GOA is an ideal location for joint exercises with Army and AF assets. In 2004, Navy received the funding to begin a series of Environmental Impact Statements (EISs) to address ongoing training at established training Range Complexes in cooperation with National Marine Fisheries Service as a cooperating agency. Because Navy training requirements are

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		the Hawaiian Islands, Jacksonville Florida, Cherry Point, North Carolina, Southern California, and now the Navy is proclaiming that the Gulf of Alaska is the best location for realistic training exercises.	similar across the various Range Complexes, training events appear to be similar. However, each training event is analyzed for impacts separately for each Range Complex.
Carolyn Heitman - 31		The Navy has a detrimental affect on marine life wherever it goes, and then does not want to accept responsibility for its actions.	The fact that the Navy is a seagoing force, and that two-thirds of the world's surface is covered by water, means that many of the environmental initiatives focus on ocean stewardship and seek opportunities to control the Navy's "ecological footprint" in relation to marine life, coastal impacts, and water quality. The Navy has installed technology aboard our ships to keep plastics out of the ocean and safely manage biodegradable waste. The Navy is a world leader in marine mammal research, and is funding approximately $26 million annually in marine mammal-related research projects from fiscal years 2007-2009. The Navy serves as the executive agent for the Department of Defense Coral Reef Task Force. Major ocean stewardship efforts can be seen in the Navy's comprehensive approach to managing effects on marine life for all training ranges and operating areas. That environmental planning documentation is being coordinated with the National Marine Fisheries Service. In addition, the U.S. Navy has programs in place to manage threatened and endangered species on and around our installations; safely clean up past hazardous waste sites for future reuse; explore and develop new, greener technologies for equipment design and maintenance; and recycle metal, wood, and glass. Navy installations and ship's crews frequently partner with local communities on volunteer shoreline and neighborhood cleanup projects.
Carolyn Heitman - 32		The Navy should be doing its part to protect and support federally threatened and endangered species in the Gulf of Alaska, Bering Sea, the Aleutian Chain and other geographic locations, rather than applying for federal exemptions to the Marine Mammal Protection Act and Bird Migratory Act, which it is consistently doing.	The Navy is not applying for exemptions but rather is fully complying with all applicable laws and is obtaining all associated permits. The EIS/OEIS under consideration is the established means by which analysis and authorization of proposed activities can be reviewed so that the Navy can ensure protection of threatened and endangered species in the Gulf of Alaska (please note that the Aleutian Chain and Bering Sea are outside the scope of Navy's proposed activities). Through this EIS/OEIS and a Biological Assessment and Application for Letter of Authorization the Navy began the regulatory process to comply with these laws. The Navy is not seeking to use exemptions from any of these laws. The Navy is also carrying out its responsibility for stewardship of marine resources in part by funding marine mammal research at a

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			rate of $26 million annually, more than most other federal agency.
Carolyn Heitman - 33		Also, the Navy should adhere to and be in compliance with the Alaska Coastal Zone Management Plan when Navy ships and submarines are in Alaska waters.	The Navy has written a De Minimis determination and submitted it to the State of Alaska DNR, as required under the law for any portions of the PA that could affect the AK coastal zone, on 29 July, 2010 pursuant to CZMA requirements. Concurrence was received on 14 October, 2010.
Carolyn Heitman - 34		Information contained in the previously mentioned Navy's GOALS document for the GOA survey, stated that although marine mammals are present year-round in the GOA, the greatest number of animals occurs during the spring and summer.	The Navy concurs with this comment.
Carolyn Heitman - 35		The humpback, fin and possibly the right whales, feed in the outer continental shelf and slope waters during the summer into fall, while blue, sei and sperm whale species are thought to be more pelagic (Berzin and Rovnin 1966, Rice 1974). In 1980 a survey conducted and described by Rice and Wolman 1982, it was determined that the populations of all great whales in the GOA had been severely depleted. Since that time some of these species have shown signs of recovery; however, only the eastern North Pacific gray whale has experienced a complete population recovery (Rough et al. 2005).	The Navy concurs with this comment.
Carolyn Heitman - 36		The Navy's GOALS project identified fin, humpback, gray, minke, and killer whales. Dall's and harbor porpoise, Pacific white-sided dolphins and Steller sea lions, harbor seals and sea otters in the GOA There were also 36 sightings (46 individuals) of unidentified large whales, dolphins, and pennipeds.	The Navy concurs with this comment.
Carolyn Heitman - 37		It needs to be noted that scientist observers on the Oscar Dyson NOAA ship had to use the towed acoustic array to collect vocalizations from all acoustically active cetaceans at times when no visual survey was possible due to high seas and winds or darkness. Under these types of weather conditions it would also be impossible for ship observers to keep visual track of whales and marine life in the GOA during Navy, Air Force, Army training exercises, which could then lead to the Navy having to use potentially harmful life threatening Low-frequency active (LFA) sonar in an attempt to locate marine life.	The Navy will use passive listening devices where applicable to help detect vocalizing marine mammals as part of its standard mitigation measures so that operators of vessels and other participants can take appropriate actions in the known presence of detected marine mammals. Analysis of LFA for use worldwide has been done separately by the Navy, but at this time the Navy is not planning to use LFA in the TMAA and it is not part of this proposed action.

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Carolyn Heitman - 38		In the GOA DEIS/OEIS, the Navy believes that the impacts of active sonar on marine mammals, turtles and birds can be decreased by using on-ship 'spotters' with high powered binoculars, aircraft spotters, and sonar technicians, but the Navy doesn't give any detailed information on the difficulty of spotting whales at any great distance. Many whales spend more time diving than they do at the surface. Biologists have said that the Navy's abilities to spot these whales any further than 1 kilometer in more than slight winds is 'zero'.	The Navy's protective measures are effective at minimizing, not eliminating, risk to marine mammals. For more information, please see response to AMCC – 7.
Carolyn Heitman - 39		GOA DEIS- Table 3.14-1-Training Activities Affecting Public Safety This section lists (1) Chaff (2) Anti-Air Warfare (AAW) Surface to Air Missile Exercise (3) EC Exercises (4) Counter Targeting Exercises There should have been more detailed information listed on the hazards of these activities to the public and the information needs to be included in the FEIS.	The comment does not specify the nature of the perceived lack of information on the hazards of specific training activities. Training activities in the TMAA are described in Section 2.4.1, with ordnance for each training activity listed in Table 2-5. Section 3.14, Public Safety, does not address potential hazards of training activities on an individual basis, but by elements of training activities under each of the alternatives. Table 3.14-1 lists ordnance use during the identified exercises. Ordnance use and safety measures are identified throughout Section 3.14.1.2. As discussed in Section 3.14, public safety is always a primary concern of the Navy's when conducting activities. As such, the Navy has extensive safety precautions built into its standard operating procedures and will always suspend any training activity when non-participating units are identified within the training area.
Carolyn Heitman - 40		Chaff has caused problems in the past from Navy activities. As an example, in 1985 the Federal Aviation Administration (FAA) tracked and timed a chaff-cloud path that correlated with a Navy exercise which caused a large power outage in San Diego. The Navy paid the electric company $49,000 in damages caused by the Navy's dropping of chaff: which is made up of hair-fine particles of aluminum and fiberglass.	Chaff is addressed on page 3.2-9 in the Expended Materials section of the DEIS. Chaff used during training activities in the Gulf of Alaska would occur miles offshore (the EIS/OEIS does not address the use of chaff at inland USAF or US Army facilities). Based on typical wind currents, chaff would be dispersed over large areas, and would not result in concentrations expected to affect biological resources, electrical facilities, or public safety.
Carolyn Heitman - 41		In a September 22, 1998 United States General Accounting Office National Security and International Affairs Division-Department of Defense report on Chaff, the report identified some unintended side effects of chaff. Chaff (a) can affect safety by interfering with air traffic control radar (b) can affect weather radar observations and the operations of friendly radar systems (c) has been reported to cause power outages and damage electrical equipment (d) has the	Chaff use is discussed in section 3.2 Expended Materials. The use of chaff during training exercises could disrupt radar and communications because of its design. However, the Chaff used during training activities in the Gulf of Alaska would occur miles offshore (the EIS/OEIS does not address the use of chaff at inland USAF or US Army facilities). Based on typical wind currents, chaff would be dispersed over large areas, and would not result in concentrations expected to affect biological

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		potential chance of collecting in reservoirs and causing chemical changes that may affect water and species that use it. Using chaff in the GOA or inland areas could have a potential life-threatening effect on marine life/ wildlife and possibly pose a health hazard risk to humans who might possibly come into contact with chaff in any situation (inhaling the aluminum/fiberglass particles or drinking them in their water supply e.g.).	resources, electrical facilities, or public safety and human health. Text regarding potential effects of chaff on public safety has been added to Section 3.14.2.
Carolyn Heitman - 42		Chaff cannot be dispensed if prevailing winds will carry the chaff into FAA air traffic control areas or into designated high and low altitude air routes (Standard Electronic Attack Clearance Request For Ranges'- Nov. 2002 White Sands Missile Range Army Manual). In spite of the Navy having knowledge of chaff hazards, the Navy and Air Force continues using it in warfare training exercises and are its leading users.	As noted above, chaff is addressed on page 3.2-9 in the Expended Materials section of the EIS/OEIS. Chaff has not been dispensed when prevailing winds would potentially carry the chaff into FAA air traffic control areas or into designated high and low altitude air routes. Prior to any activities involving chaff, coordination with and approval from the FAA is required under these conditions.
Carolyn Heitman - 43		Aside from the previously mentioned hazards from chaff use, another major concern is any potential risks to the electrical equipment of small or commercial aircraft in Alaska's heavily-used airspace, possibly causing the engines to fail. Rather than jeopardize the safety of humans and marine/wildlife, the use of chaff should be permanently discontinued by the Navy, Air Force and Army.	The Navy employs chaff in accordance with and approval from the FAA. To date, no small or commercial aircraft accident has been attributed to engine failures due to Chaff ingestion. Additionally, as analyzed in the EIS and based on typical wind currents, chaff would be dispersed over large areas, and would not result in concentrations expected to affect biological resources or public safety.
Carolyn Heitman - 44		The GOA DEIS did not state if Depleted Uranium or White or Red Phosphorus use is being proposed for use in the GOA or inland areas. Include this information in the FEIS.	All inland areas have been discussed within other NEPA documents that have been incorporated by reference and listed in Section 1.5.1. However, Depleted Uranium (DU) is not part of the proposed action for this EIS/OEIS. In February 2009, Commander Pacific Fleet directed that all Pacific Fleet ships offload all depleted uranium rounds at the earliest opportunity. This change is reflected in the EIS/OEIS in Section 3.2.1.1. White phosphorous was mentioned in Section 3.2.1.1 as a possible constituent of general pyrotechnic materials. White phosphorous, however, is not a constituent in training materials proposed for use in the Gulf of Alaska TMAA. White phosphorous has been removed from the Final EIS/OEIS. Red phosphorous is mentioned one time in the Draft EIS/OEIS as a compound contained in the MK-58 marine marker. Please see Section 3.2.1.1.

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Carolyn Heitman - 45		The deposition of washout of White Phosphorus, especially in water bodies may create exposure risks to resident fish, invertebrates and waterfowl, even if the resultant White Phosphorus concentrations are in the low ppb range (Berkowitz et.al1981». White Phosphorus is highly toxic to both experimental animals and man and is highly toxic to aquatic animals ('Mammalian Toxicology and Toxicity to Aquatic Organism of White phosphorus and Phossy Water' by Authors Dickinson Burrows; Jack C. Dacre: AWARE INC. Nashville TN).	Please see response to AMCC – 15 regarding a discussion of expended materials. Additionally, please note that white phosphorous is not used in the Gulf of Alaska. White phosphorous was mentioned in Section 3.2.1.1 as a possible constituent of general pyrotechnic materials. White phosphorous, however, is not a constituent in training materials proposed for use in the Gulf of Alaska TMAA. As such, white phosphorous has been removed from the Final EIS/OEIS.
Carolyn Heitman - 46		A map in the GOA DEIS (page 2-4) shows Kodiak Island within a large 'restricted area' (outlined in red). Since the DEIS refers to 'activity outside the training area', but does not give further details, is Kodiak Island being proposed as a future Military Training Route (MTR) or 'restricted area' as part of future GOA warfare training exercises?	The red box in question was intended to be a map insert, which is a standard way of identify a specific geographic region that is being discussed. The "map inset" has been re-colored to avoid any confusion.
Carolyn Heitman - 47		Considering the fact that the Kodiak Launch Complex has access to the 'Gulf of Alaska Maritime Exercise Area' and the Air Force and Army have used the launch complex for their missile tests in past years, then it is reasonable to assume that the Navy would want to include Kodiak Island in future GOA training exercises, if a missile(s) were to be launched from the launch complex, tracked and intercepted/destroyed by whatever means during a training exercise. If Kodiak is going to be a part of future GOA warfare training exercises, the information needs to be included in the FEIS and shown on the included Alaska Military Airspace map(s).	The scope of the Proposed Action is described in Chapter 2 of the DEIS. The Kodiak Island facility is not an element of the Proposed Action.
Carolyn Heitman - 48		Section 3.14-Public Safety states the public could be at risk from ship and aircraft activities and from the emissions of acoustic and electromagnetic energy (e.g. sonar and radar), but no specifics are given as to what radar or sonar systems. This needs to be discussed in further detail in the FEIS. Which radars/sensors will be transmitting into air space as part of warfare training exercises? The DEIS mentioned lasers, radio frequency and particle beam weapons, but no detailed information. Also mentioned but not discussed was 'new weapon systems'. In the FEIS list the weapon systems, their locations, maximum power levels, and transmission hazards to the public.	The analysis in the EIS/OEIS indicates that neither radar nor lasers would pose a risk to the public. Section 3.14.1.2 (Current Requirements and Practices) states that, "SOPs in place to protect Navy personnel and the public [from radar] include setting the heights and angles of EMR transmission to avoid direct exposure, posting warning signs, establishing safe operating levels, and activating warning lights when radar systems are operational. The EIS/OEIS also states in Section 3.14.1.2 that only eye-safe lasers are used during Navy training exercises in the GOA. Navy training exercises in the GOA would take place over 12 nautical miles offshore, where no recreational activities, including diving, would be expected to take place. Sonar would only affect humans in the water, and would not affect humans

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			on vessels even when within the portion of the vessel under the surface of the ocean. Navy mitigation measures would ensure that non-participants would be a sufficient distance from the sound source before using active sonar. Sonar systems used in Navy training activities in the GOA are described in Section 2.5.2.1. New weapon systems include Advanced Extended Echo Ranging Sonobuoy (AEER)/Multi-static Active Coherent (MAC) sonobuoy, and new training instrumentation includes a Portable Undersea Tracking Range. The current and proposed list of weapons systems and pertinent information is contained in Chapter 2 of the EIS/OEIS. Particle-beam weapons are not contemplated for use in GOA training activities.
Carolyn Heitman - 49		Through the University of Alaska-Fairbanks, the Navy funds the Kodiak High Power Microwave Array (located in Chiniak). The microwave fits into the category of what the Navy calls an 'Electromagnetic Warfare Weapon' System (the transmission power levels having the ability to interrupt the electronics on a plane or missile, causing them to "stop dead in their tracks", according to Department of Defense documents). The microwave antenna field has been upgraded since the radar was first installed and the sensors operate individually in various directions and frequencies and is a substation of the Navy's HAARP facility in Gakona. If the Navy is proposing to use the Kodiak microwave in future warfare training exercises, then it needs to be included in the FEIS along with potential transmitting hazards to the public, since many small commercial aircraft use the airspace around Kodiak Island and also the airspace between Kodiak and other Alaska communities.	The scope of the Proposed Action is described in Section 2 of the EIS/OEIS. The Kodiak Island High Power Microwave Array is not an element of the Proposed Action.
Carolyn Heitman - 50		The Navy stated in the GOA DEIS that the Gulf of Alaska was the best place for the Navy, Air Force and Army to do their combined Electronic Combat training exercises. That is a fallacy because the Nellis Range Complex-Nellis Air Force Range in Nevada supports Department of Defense and Department of Energy 'Advanced Electronic Combat' training and testing. Therefore, no Electronic Combat Exercises need to be tested in the Gulf of Alaska or inland areas.	The Navy does not state that the GOA is the best place for the Navy, Air Force, and Army to do their combined Electronic Combat training exercises. However, the uniqueness of the GOA is the ability to bring the services together to train in a joint scenario. Electronic Combat is just one of many exercises that, accomplished in a joint environment, provide added benefit and training to the participants. The Navy does however recognize the unique capabilities of the Nellis complex for aircraft oriented electronic combat, but it has no capabilities to support vessel and electronic combat training.

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Carolyn Heitman - 51		Finally, the 'No Action Alternative' is not a true alternative because if the public chooses that first alternative, the Navy will continue doing Gulf of Alaska activities at the current levels. In the Elmendorf 'Final EA/OEA-Northern Edge Joint Training Exercise' (proposed Action and Alternatives), five alternatives were evaluated and under the 'No Action Alternative', joint training exercises in the Gulf of Alaska would not be conducted. The GOA DEIS should also have included a 'true' No Action Alternative which would have discontinued Gulf of Alaska training exercises, as the 'No Action Alternative' also poses environmental hazards and risks. Rather than having to choose an Alternative that is really NOT an option, I am requesting that the Navy discontinue its environmentally damaging presence in the Gulf of Alaska. Carolyn Heitman	The Forty Most Asked Questions Concerning the Council on Environmental Quality's National Environmental Policy Act Regulations, Number 3, addresses the question of No-Action alternatives. For EISs that study management levels of Federal assets, the no-action alternative is seen as the current management level of asset usage-in this case, status-quo as the current level of range usage. The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027). In comparison to Northern Edge, this NEPA document analyzes a new scope of potential impacts and separate activities which requires a separate set of alternatives from the current (baseline) training levels. Regarding your Alternative suggestions; NEPA documents provide both the public and the decision maker with analyses of the potential environmental effects of proposed actions and alternatives. However, the federal decision maker, in this case, the Assistant Secretary of the Navy, will make the final decision.
Roberta Highland	Kachemak Bay organization	Please include a question and answer 1/2 to 1 hour - before the public meetings/comment time - so our questions can be answered as a group and everyone can hear the answer and learn. <u>In the future</u>	From past experience, the Navy has concluded that the public hearing format used during the public hearings is the most conducive to effective dialogue and fosters a peaceful and non-confrontational setting for all involved. Additionally, all five public hearings held in Alaska met NEPA requirements. Adequate time was given during each meeting to ask questions of a number of subject matter experts. All public comments received on the DEIS will be analyzed and addressed in the Final EIS/OEIS.
Roberta Highland & Robert Archibold - 1		We are very concerned at the proposed of expanding Navy training activities (NTA's) in the Gulf of AK. We oppose any expansion of these activities. However, we actually oppose any NTA's in this richly biodiverse area. The NTA's will pollute and cause disturbance to many species of mammals and fish.	The U.S. Navy has been conducting these same activities in the Gulf of Alaska for many years and has an excellent record as a steward of the oceans. Although the Navy's activities will cause a temporary disturbance to some marine mammals, they would not result in a population-level or significant impact to fish resources or fisheries because of the temporary nature of the Navy activities and given the movement of the participants and the length of the proposed training. For additional information, please see responses to Greg Brown – 11 through 15.
Roberta Highland & Robert Archibold - 2		We cannot think of any Alaskan H_2O's that are already so polluted; except for Cook Inlet which has already been sacrificed to irresponsible development and a critical habitat is presently being considered; that NTA's would not	By law, the Navy is required to follow federal laws and regulations regarding water quality, hazardous materials and hazardous wastes, protection of fisheries, and protection of special status species. Please see response to AMCC – 15.

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		adversely affect.	Additionally, please note that initial releases and peak concentrations of hazardous materials from expended materials would not result in water or sediment toxicity. Hazardous materials would be quickly dispersed by ocean currents to non-toxic concentrations, and would not be expected to adversely affect marine organisms. The analysis in the EIS/OEIS indicates that Navy training activities in the TMAA would not result in violations of any State or federal water quality regulation.
Roberta Highland & Robert Archibold - 3		We did not know of NTA's already occurring in this area and were shocked to discover they had been going on for 10 yrs - especially in May and June, which is the worst time frame for any such activities. However, as you heard at the public hearing, there is no "good" time for the whales.	The U.S. Navy has been training in the Gulf of Alaska for many years and will continue to act as a good steward of the environment as we have in the past. Similar to all other areas that the Navy trains, there is no indication that training activities have a negative impact on the health of the marine environment. In addition and as presented in Chapter 5, the Navy will implement mitigation measures to minimize potential impacts. As such, the Navy is confident, and the analysis indicates, that its training activities will not detrimentally impact the marine environment of the Gulf of Alaska.
Roberta Highland & Robert Archibold - 4		Active sonar testing has been well documented to be extremely adverse to mammals, esp. whales and may possibly affect the incredible system fish use to return to "whence they came."	The U.S. Navy has been using mid-frequency and high-frequency active sonar for decades in the Fleet concentration areas of the East Coast, Southern California, and Hawaii for decades with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals or fish at those locations as documented in monitoring reports at these training ranges (see “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). . It is very unlikely that sonar is "extremely adverse" to marine mammals and all indications are that fish cannot hear mid-frequency sonar. Please see Section 3.6 on a discussion of fish in the TMAA and Appendix F for a discussion of marine mammal strandings associated with sonar use.
Roberta Highland & Robert Archibold - 5		Humans have to do a better job of respecting our precious oceans and we have grave concerns about ocean acidification. Please see the file "sea Change".	The overall issue of ocean acidification is addressed under Cumulative Impacts in Section 4.2.1.2.
Roberta Highland & Robert		We understand the need for the NTA's, though it is a sad state of affairs - but reality is harsh. The Navy is in a tough position when looking for H2O's to practice NTA's. The use	The Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential effects as presented in Chapter 3 of the EIS/OEIS. Chapter 4

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Archibold - 6		of any under H2O explosives over the continental shelf could have dire consequences for any migrating mammals and fish, thus we reiterate - we are opposed to any increase in NTA's and any activities of this nature in this rich body of H20. P.S. Consider using the 4E's for decision making: Economy, Environment, Energy, Ethics. Sincerely, Roberta Highland and Robert Archibold.	includes cumulative analysis of all past, present, and reasonably foreseeable future projects by the Navy and non-Navy activities. Based on having conducted most of the proposed training activities over the last 10 years in Gulf of Alaska and with the mitigation measure presented in Chapter 5 of the Final EIS, the Navy believes this history and the analysis presented in the Draft EIS accurately present the likely risks and protections to marine mammals and fish.
Bobbie Ivanoff		It is clear that the location of current proposed Temporary Maritime Activities Area is directly in the path of migrating whales. Also, sonar is well known to negatively affect whales, dolphins. Why does alternate plans include moving - redirecting the activity area away from and especially the path of migrating whales?	Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, including migrating gray whales in California waters and humpback whales in Hawaiian waters, moving training events to other areas is not justified as presented in detail in Section 5.2.1.6.
Katchemak Bay Conservation Society (KRCS) - 1		**The Kachemak Bay Conservation Society (KRCS) requests that the public comment period be extended for the Proposed Gulf of Alaska Navy Training Project.** The community closest to the proposed training site was left out of the public hearings, although this community would be the most likely affected.	Though it is not clear which community the commenter feels is the closest to the proposed training site, please note that Public hearing locations were determined based on the location of potential or perceived impacts to the human environment. Because of the large geographic area of the GOA ATA's, the Navy chose public hearing locations that would enable it to contact as many people as reasonably possible. Five locations for public hearings were chosen in Alaska: Anchorage, Cordova, Homer, Juneau, and Kodiak.
KRCS - 2		Also, notification in the newspapers was insufficient in the small communities most affected, including Homer, Kodiak, and Cordova.	Public notification in the Peninsula Clarion, the Kodiak Daily Mirror, and the Cordova Times were a series of three display advertisements placed in each newspaper. The first series of newspaper advertisements occurred after the NOA/NOPH was published in the Federal Register and ran for three consecutive days in the respective papers. The second series of newspaper advertisements was published a week and a half prior to the public hearings dates. The third series of newspaper advertisements was published three days prior to the public hearing dates, including the day of the public hearings. The dates for the Peninsula Clarion were: 14 December 2009, 15 December 2009, 16 December 2009, 28 December 2009, 30 December 2009, 6 January 2010, 7 January 2010, and 8 January 2010. The dates for Kodiak Daily Mirror were: 14 December 2009,

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			15 December 2009, 16 December 2009, 28 December 2009, 5 January 2010, 6 January 2010, and 7 January 2010. The dates for Cordova Times were: 14 December 2009, 15 December 2009, 16 December 2009, 28 December 2009, 30 December 2009, 6 January 2010, 7 January 2010, and 8 January 2010.
KRCS - 3		KBCS reluctantly supports the **No Action Alternative**. After careful review of the DEIS, KBCS concludes that the Navy has not provided sufficient evidence or support for their claims of minimal or no impacts in a multitude of aspects. KBCS also concludes that the Navy DEIS fails to consider or completely ignores impacts that would cause incredible harm to the health and well-being of Alaska's people, wildlife, and environment.	This comment is duly noted.
KRCS - 4		The proposed testing area is adjacent to the eastern Kenai Peninsula and just south of the Prince William Sound. These areas are renowned tourist and fishing destinations because they are some of the world's biologically richest. The shallow shelf that skirts the edges of the GOA is highly productive, creating an abundance of prey foods for marine life large and small. Choosing to conduct testing in this area threatens the short and long-term health of the wildlife, people, and ocean in this region.	This comment is duly noted. Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Please see Chapter 3 of the EIS/OEIS for the description and analysis and potential effects. Specifically, those effects to the economy are found in Section 3.12; to marine life in Sections 3.5 through 3.9.
KRCS - 5		**Socioeconomic Impacts:** 1) In the discussion of impacts to both Socioeconomics and Fish, the Navy does not provide research into effects of its proposed activities on the types of fish that are harvested commercially (sport or commercial fishing) in this region. The DEIS makes broad discussions of generalist and specialist types of hearing among fish, and makes the claim that "most" fish are generalists. The DEIS does not state whether halibut, herring, rockfish, or salmon are generalists or specialists. Thus, they cannot make the claim of "no significant impacts."	The Draft and Final EIS/OEIS provides a table (Table 3.6-3) of hearing sensitivities for many families of marine fish including those species you are concerned about. For example, salmon are known to be generalists and were listed in the table under the family Salmonidae. Herring are listed under the family Clupeidae (they are hearing specialists). Halibut were not specifically identified in the table by common name (this edit has been made for the FEIS/OEIS), but they were in the table in the Draft EIS/OEIS as they are part of the family Pleuronectidae (flatfish) and are hearing generalists. Finally, rockfish were also in the table under the family Scorpaenidae (hearing generalists).
KRCS - 6		The DEIS does state that fish are known worldwide to avoid areas where sonar testing is being conducted. Thus, from the DEIS's own statements in this document one could reasonably conclude that the fish in the testing area would in fact avoid the area. As a result, there would be impacts on the fish. Given the likelihood of impacts on the fish, above, then one	It is incorrect to state that "fish are known worldwide to avoid areas where sonar testing is being conducted" and there is no statement in the DEIS to indicate that may be the case. As detailed in Section 3.6 of the DEIS, there should be no impact to fisheries in the Gulf of Alaska from sonar use or any of the other proposed or ongoing training activities. There is no "sonar testing" proposed but training using sonar is proposed

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		could reasonably conclude that the commercial fishers fishing in the proposed test area may be affected. Given that commercial fishing for some species is set to occur only at prescribed times according to federal and state laws (called "openers"), then the impacts from the testing could cause great harm to fishers who were unable to find fish or fish during times with Navy testing overlapped an opener. In addition, sonar testing, according to the DEIS, can cause harm to fish, thus, any harm to the fish that reduced the numbers of these fish due to disorientation, physical harm, or other aspects, could cause a reduction in the harvest of fish for that season. This would be a socioeconomic harm.	and it is not anticipated there will be any impact on any fishery resulting in any socioeconomic harm.
KRCS - 7		2) The DEIS also does not take into consideration the socioeconomic impacts for the tourist industry for the entire area, Seward to Homer, that are likely with the proposed alternatives. The DEIS states that for Alternative 2 the NMFS "takes" would likely be 425,551 marine mammals, much of those dolphin. In Alternative 1, this number is 215,519. The number of takes predicted by the DEIS is likely to cause a drop in the number of marine mammals in the area. Given that one of the primary economic businesses in the area, Seward, is whale watching, it is likely that any reduction in these animals will cause harm to the businesses that depend on the marine life in the area. Notably, the proposed testing area is immediately adjacent to the Kenai Fjords National Park, a Park that draws nearly 300,000 people every year.	Socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. To help manage competing demands and maintain public access in the GOA, the Navy conducts its offshore activities in a manner that minimizes impacts to recreation and commercial activities. Furthermore, no new closure or restricted areas are proposed. Please note that there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment. With regard to takes, please see response to Greg Brown – 1.
KRCS - 8		**Marine Mammal Impacts:** 3) There is much discrepancy between how the Navy DEIS evaluates noise impacts and how other reputable marine mammal scientists evaluate these impacts. There are numerous instances of impacts on whales and dolphins by sonar testing. [See next cell for entire list:]	The science of sound in the water and its effects on marine life is evolving. The Navy conducted a thorough analysis of sonar and at sea explosions in the Draft EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. While additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. As such, the Navy believes it has fully analyzed the potential impacts to marine life.

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KRCS - 9		Here is a list compiled by other environmental organizations: • January 2006 At least four beaked whales strand in the Gulf of Almeria, Spain, while sonar exercises take place offshore. • January 2005 At least 34 whales of three species strand along the Outer Banks of North Carolina as Navy sonar training goes on offshore. • July 2004 Four beaked whales strand during naval exercises near the Canary Islands. • July 2004 Approximately 200 melon-headed whales crowd into the shallow waters of Hanalei Bay in Hawaii as a large Navy sonar exercise takes place nearby. Rescuers succeed in directing all but one of the whales back out to sea. • June 2004 As many as six beaked whales strand during a Navy sonar training exercise off Alaska. • May 2003 As many as 11 harbor porpoises beach along the shores of the Haro Strait, Washington State, as the USS Shoup tests its mid-frequency sonar system. • September 2002 At least 14 beaked whales from three different species strand in the Canary Islands during an antisubmarine warfare exercise in the area. Four additional beaked whales strand over the next several days. • May 2000 Three beaked whales strand on the beaches of Madeira during NATO naval exercises near shore. • October 1999 Four beaked whales strand in the U.S. Virgin Islands during Navy maneuvers offshore. • October 1997 At least nine Cuvier's beaked whales strand in the Ionian Sea, with military activity reported in the area. • May 1996 Twelve Cuvier's beaked whales strand on the west coast of Greece as NATO ships sweep the area with low- and mid-frequency active sonar. • October 1989 At least 20 whales of three species strand during naval exercises near the Canary Islands. • December 1991 Two Cuvier's beaked whales strand during naval exercises near the Canary Islands. These issues should be addressed honestly and with a goal of conducting legitimate, unbiased research. Creating science that simply downplays the real effects of potentially lethal activities is morally imprudent and does not give the U.S. citizen the right to an educated choice.	A complete review of documents associated with marine mammal stranding events is presented in Appendix F and reference to species in the Gulf of Alaska is presented in Section 3.8. Regarding science, please see response to Greg Brown – 3.
KRCS - 10		4) The DEIS does not address potential impacts to marine mammals that feed primarily on the seafloor. Gray whales	Chapter 3 of the EIS/OEIS provides an analysis of the proposed action with regard to marine mammals within the

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		could easily scoop up spent debris and pollution from the proposed testing activities.	TMAA including those that feed from the seafloor. Specifically with regard to potential impacts to marine mammals such as gray whales feeding from the seafloor, see for example Pages 3.8-130 and 3.8-133.
KRCS - 11		**Toxicity** 5) There will be an inordinate amount of toxins dumped into a region known worldwide as being particularly clean. This could have impacts on the health of all life in the ocean and economic impacts for commercial and sports fishers.	Please see response to AMCC – 15. Additionally, please note that potential economic impacts to fishing are discussed in Section 3.12.2.5. In this section, the analysis concluded that impacts would not be significant due to advanced public notification and primarily short-term duration of military activities. Additionally, no new closure or restricted areas are proposed.
KRCS - 12		**Cumulative Effects** 6) The DEIS does not take into consideration elements of climate change that directly effect the proposed tests. In particular, the new scientific evidence that is showing that ph changes (acidification) of the oceans increases the transfer of sound through the ocean.	Climate change and ocean acidification are addressed under Cumulative Impacts in Sections 4.2.1.1 and 4.2.2.1 of the EIS/OEIS.
KRCS - 13		7) There is a profound lack of attention to the cumulative effects of all the toxins that the testing will discharge into the water.	Effects of past, present and planned Navy activities and projects in the GOA have been discussed in Chapter 4, Cumulative Impacts. Toxins, with the exception of heavy metals, from other projects or activities would not be the same as those released during Navy training activities. The large size of the GOA, however, would make it unlikely that the cumulative effects of Navy and other expended materials would result in toxic concentrations.
KRCS - 14		8) The DEIS fails to take into consideration the impacts of the Exxon Valdez Oil Spill, particularly in regards to salmon returns and otters.	The TMAA is many miles distant from and does not include Prince William Sound where the Exxon spill occurred.
KRCS - 15		**Mitigation** 9) The proposed mitigation measures would fail to protect any marine life. It is wholly unreasonable to expect anyone aboard a ship to spot a whale that is more than a few yards away from the ship. The Gulf of Alaska is known to have frequent high seas, winds, and rain that would make it nearly impossible for scouts to observe Whales. It is ludicrous that this mitigation measure is even proposed. The Navy was sued by NRDC over these measures, with the court finding stating that the measures were "woefully inadequate and ineffectual." According to research, only 5% of marine mammals are able to be spotted this way.	Chapter 5 presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events at sea in the TMAA. As detailed in that section of the EIS/OEIS, the mitigation measures involve much more visual detection from ships and make use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the documentation from previous Navy exercises involving sonar, Navy lookouts have been able to detect marine mammals at distances greater than 1 kilometer and in winds that are almost

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			universally greater than "slight" (see “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). The Navy does not expect 100% of the animals present in the vicinity of training events will be detected, however, mitigation measures will result in the mitigation of some potential impacts. The mitigation measures presented in the EIS/OEIS were developed in coordination with NMFS biologists and scientists to determine which mitigation measures would be both effective and still allows for the Navy to meet the operational needs for realistic training. Please note that the comment referencing studies indicating "a 5% success rate" was with regard to survey protocols, were not done using Naval personnel or vessels (which have a higher height of eye), and did not take into account the circumstances present during a training event such as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space.
KRCS - 16		10) The DEIS eliminates important mitigation measures they were required to use elsewhere. A region as biologically rich and as economically dependent on marine life as the proposed testing region warrants much more diligent attempts at reasonable and functional mitigation measures.	Please see the response to KRCS - 15.

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KRCS - 17		11) Comparing impacts from the southern ocean region near San Diego, as was done by a representative at a public comment period, with the GOA is not logical. These are two very different ocean ecosystems. And, there is no viable commercial fishery in the region the Navy "usually" tests in, unlike the GOA. Please reconsider your plans. Thank you for taking our comments. Elise Wolf, KBCS	Granted the two ecosystems are very different, however, the context for the comparison made by a Navy representative at the hearing may have been appropriate. The area around the Southern California Range Complex has an extremely productive commercial and recreational fishing industry. In addition, the Navy has been conducting these same training activities for decades on training ranges in locations such as the East Coast, Hawaii, and Southern California where populations of whales appear to thrive, with no indications of injuries to marine mammals. There have been no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis for the Gulf of Alaska demonstrates there is little relative risk to marine mammal or fish populations from Navy training exercises as proposed in the EIS/OEIS.
Ryan Kingsbery - 1		Dear Amy Burt, I am writing to voice my concern with two specific aspects of the recently released Gulf of Alaska Navy Training Activities Draft EIS/OEIS (December 2009). My personal background is weighted in northern fur seal (*Callorhinus ursinus*) population biology and marine debris entanglement, particularly in the Bering Sea/Pribilof Island region. I am currently pursuing an M.S. in Environmental Science at Alaska Pacific University in Anchorage, Alaska. My first concern takes issue with the listing of the northern fur seal population trend as "increasing" as is stated on page 328 in Table 3.8-1 and indicated at the bottom of page 386 under section 3.8.5.4 Northern Fur Seal: Population Size and Trends. According to the Alaska Fisheries Science Center: National Marine Mammal Laboratory (NMML) 2008 Quarterly Report, up production in the Pribilof Islands has declined at an annual rate of .2% since 1998.[1] Towel et al. (2006) also notes that between 1998 and 2004 pup production on the Pribilofs has declined by 6% each year.[2] I therefore contend that the listing on the northern fur seal population trend as increasing as is stated in the EIS/OEIS, is not accurate and runs counter to current population studies. [1]- Alaska Fisheries Science Center: National Marine mammal Laboratory Quarterly Research Report (2008), PDF downloadable at http://www.afsc.noaa.gov/Quarterly/ond2008/tocNMML.htm,P.13 [website last accessed 1/18/10]	Thank you for the comment. The U.S. Navy has edited Section 3.8.5.4 on the fur seal to correspond to the specifics of the population trend as provided.

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		[2]- Towell RG, Ream RR, York AE (2006) Decline in fur seal (Callorhinus ursinus) pup production on the Pribilof Islands. mar Mamm SCI 22:486-491	
Ryan Kingsbery - 2		Secondly, I agree with public concerns outlined in Table 1.1. Public Scoping Comment Summary on page 69, more specifically the effects of harmful levels of noise on whales particularly both species of beaked whales (*Berardius bairdii, Ziphius cavirostris*) and endangered species such as the North pacific Right Whale (*Eubalaena robustus*).	The Navy shares your concern for marine life. The Navy has conducted mid-frequency and high-frequency active sonar activities for decades with no indications of injuries to resident beaked whales at training ranges in Hawaii and Southern California or to right whales on the East Coast. There are no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Ryan Kingsbery - 3		I disagree with the statement found on page 362 under section 3.8.4.1: Impacts of Human Activity, that says there is new evidence that beaked whales are not sensitive to Navy sonar. There is sufficient evidence in the form of well-documented cases that link certain sonar frequency levels with beaked whale strandings.[3] [3]-National Research Council (2003) Ocean Noise and marine mammals. The national Academies Press, Washington, D.C., accessed by way of University of Rhode Island, office of Marine Programs, http://www.dosits.org/animals/effects/e1a-d.htm. [website last accessed 1/18/10]	Please see Appendix F for a discussion regarding strandings of beaked whales in association with sonar use. While there have been a number of beaked whale strandings as detailed in the Appendix F and as noted in the reference cited from 2003, evidence from subsequent and recent research projects have indicated the presence of beaked whales in areas where training and sonar use has occurred for decades without resulting in the stranding of beaked whales. The reason for including the quote is that new evidence from controlled exposure experiments is documenting that beaked whales exposure to mid frequency sonar is not, in all cases and maybe most cases, going to result in strandings or injury to those animals.
Ryan Kingsbery - 4		Also, on page 349 under section 3.8.3.4: Acoustics there is mention of adverse behavioral changes observed when Right Whales are submitted to noise levels between 133 and 148 dB, but beyond this there is no other research indicated. This species in particular is the most vulnerable whale present in the TMAA due to current population numbers and therefore I think it demand special attention.	The study referenced in the EIS/OEIS (by Nowacek et al. 2004) on right whales in the Atlantic exposed those whales to a sound designed to be an "alert stimuli" to scare them away from ships as a collision avoidance measure. This "alert stimuli" was nothing like Navy sonar or any other Navy sound source. The "alert stimuli" signal was an 18 min exposure consisting of three 2-minute signals played sequentially three times over. The three signals had a 60 percent duty cycle and consisted of: (1) alternating 1-sec pure tones at 500 Hz and 850 Hz; (2) a 2-sec logarithmic down-sweep from 4,500 Hz to 500 Hz; and (3) a pair of low (1,500 Hz)-high (2,000 Hz) sine wave tones amplitude modulated at 120 Hz and each 1-sec long. The purposes of the alert signal were (a) to provoke an action from the whales via the auditory system with disharmonic signals that cover the whales estimated hearing range; (b) to maximize the signal to noise ratio (obtain the largest difference between background noise) and c) to

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			provide localization cues for the whale. Five out of six whales reacted to the signal designed to elicit such behavior.
Ryan Kingsbery - 5		In summary, I think there needs to be more convincing research and additional mitigation that takes into account the sensitivity of the aforementioned species. Thank you for allowing me to comment on this EIS/OEIS. I look forward to your response. Sincerely, Ryan Kingsbery.	Thank you for your participation in this public comment process.
Kitsap Trees and Shoreline Association – Donald Larson		Address update: Kitsap Diving Association 3815 Tracyton Beach Rd Bremerton WA 98310-2050	Thank you - your address has been updated.
Whitney Lowe		The navy has a history of poor environmental stewardship including dumping high volumes of garbage into the ocean as well as toxic materials from explosive ordinance. Consequently it is difficult to believe what they might say about being responsible with environmental impacts of their actions. In these times of international terrorism it is easy to throw out the fear card and say all these training exercises are necessary to keep our country safe. Trumping up people's fears has routinely led to trading off the health and safety of human and other animal habitats because supposedly it was going to make us safer. At some point it would be great to think that we might learn that the answer to making us safer doesn't result from bigger and more powerfully destructive weapons, nor from destroying our surroundings in the pursuit of those weapons. At the present moment, we have a situation of drastic concern with our worldwide fisheries and marine environment. A November 2006 article in the journal *Science* suggested there will be virtually nothing left to fish from the seas by the middle of the century if current trends of catastrophic fish population declines continue. The primary culprits involve overfishing, pollution, and other environmental factors In the face of these issues it is totally irresponsible to increase military training which involves toxic dumping and tactics known to kill and injure marine life. We should be going to great lengths to do anything we can to not only mitigate our current practices that are causing that precipitous decline, but to reverse this trend. To engage	Please note that the fact that the Navy is a seagoing force, and that two-thirds of the world's surface is covered by water, means that many of its environmental initiatives focus on ocean stewardship and seek opportunities to control its "ecological footprint" in relation to marine life, coastal impacts, and water quality. The Navy has installed technology aboard its ships to keep plastics out of the ocean and safely manage its biodegradable waste stream. The Navy is a world leader in marine mammal research, and has funded approximately $26 million annually in marine mammal-related research projects from fiscal years 2007-2009. The Navy serves as the executive agent for the Department of Defense Coral Reef Task Force. Major ocean stewardship efforts can be seen in the Navy's comprehensive approach to managing effects on marine life for all of its training ranges and operating. Please see Section 3.2 of the Final EIS/OEIS and the response to AMCC – 15 for a discussion of Expended Materials. Please also note that the Navy does not dump any toxic pollutants into any water anywhere nor has the Navy proposed doing so in this EIS/OEIS. Also, refer to Sections 3.5 to 3.8 regarding potential impacts to various species of marine life. Except for the possible although unlikely impact to a small number of individual fish (see Section 3.6.4), there are no known proposed activities that are likely to kill or injure marine life.

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		further military exercises in this region that is extremely rich in sensitive marine life is a blunder of serious proportions and represents incredibly poor judgment. Our children and descendants, in whose hands we leave this critically injured world, will be asking... What were they thinking?... We can't afford to participate in this process as it represents the epitome of irresponsibility and drastically poor Judgment.	
Marine Mammal Commission (MMC) - 1		Dear Ms. Burt: The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS) referenced in the Navy's 15 December 2009 *Federal Register* notice (74 Fed. Reg. 65761) regarding proposed activities in the Gulf of Alaska. On 22 April 2008 the Commission commented on the Navy's Notice of Intent to prepare an environmental impact statement for those activities. The recommendations and rationale that follow either reinforce or expand upon those earlier comments.	This comment is duly noted.
MMC - 2		**RECOMMENDATIONS** The Marine Mammal Commission recommends that the Navy- • revise its DEIS to ensure that (1) all activities included under the no-action alternative have been evaluated,	For EISs that propose a new tempo of current training, the no-action alternative is seen as the current management level of asset usage-in this case, status-quo as the current level of training area usage. The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027). Alternatives 1 and 2 discuss the increase from these levels. This is the approach properly taken in developing alternatives for this DEIS. (See #3 of CEQ's Forty Most Asked Questions). The Navy has discussed all alternatives that were considered but eliminated in Section 2.3.2 and the consideration of the no-action alternative, alternative 1, and alternative 2 within Chapters 3 and 4 ensures the Navy's compliance under NEPA. As explained in Section 2.3.2 of the EIS/OEIS, a reduction in levels of training within the GOA ATAs would not support the Navy's Purpose and Need and was therefore eliminated from further consideration. As stated above, the decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.

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MMC - 3		(2) the alternatives evaluated and presented to decision-makers and the public include a reduction in activity level,	Please see response to MMC – 2.
MMC - 4		and (3) the scope of decision-making is not constrained unnecessarily;	The decision maker (signing the Record of Decision) for this EIS is not constrained in anyway and is free to choose any alternative or to create a hybrid alternative as required. The scope of this EIS/OEIS is based on the purpose and need as necessary to fulfill the military readiness objectives as described in Chapter 2.
MMC - 5		• resolve inconsistencies, omissions, and errors in the DEIS and either reissue it or use some other mechanism to allow decision-makers and the public to review and respond to the revised information;	Please see the following responses to your comments.
MMC - 6		• withdraw the current section of the DEIS dealing with Cook Inlet beluga whales, conduct the essential analysis of effects on this endangered stock, and reissue at least that section of the amended DEIS;	The Navy will not add analysis of the area because the Cook Inlet is located far from the proposed action and not within the area for consideration of impacts. By the definition of what constitutes a Cook Inlet beluga whale, none of these endangered species should occur anywhere near the TMAA or within the Gulf of Alaska. As depicted on Figure 1-1, the nearest shoreline at Kenai Peninsula is located approximately 24 nm (44 km) north of the TMAA's northern boundary and the nearest boundary for the Cook Inlet beluga whale habitat is beyond that distance. The approximate middle of the TMAA is located 140 nm (259 km) offshore, far from the Cook Inlet.
MMC - 7		• provide explicit and detailed descriptions of the measures that will be used to avoid risks to certain species or stocks of special concern (i.e., eastern population of North Pacific right whales, western population of Steller sea lions, AT1 pod of killer whales in and around Prince William Sound [although occasionally ranging more widely], sperm whales, humpback whales, fin whales, and sei whales);	Chapter 5 presents details of the U.S. Navy's protective measures, outlining steps that would be implemented to protect all marine mammals and Federally listed species during training events. These protective measures would afford the maximum protection to all marine animals, regardless of the species.
MMC - 8		• expand the description of marine mammal habitat use in the Gulf of Alaska by reviewing the considerable body of information on species-specific distribution and movement patterns obtained from whaling records, scientific research, and other sources over the past century;	The Navy has worked closely with marine mammal experts and NMFS on the analysis for density estimates and species distribution across the GOA range of influence. The scientific research implemented in determining the potential impacts from the proposed actions is a complete analysis of the status of marine mammal species and populations in the Gulf.
MMC - 9		• evaluate the anticipated effectiveness of monitoring and mitigation measures; and	As presented in Section 5.2.1.3, Navy is committed to implementing a monitoring program of research and one of the areas of investigation will be to evaluate, with NMFS in a cooperating role, the effectiveness of the monitoring and mitigation measures. Please see response to AMCC – 7 above regarding monitoring reports.

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MMC - 10		• require vessel commanders to retain vessel logs and reports for a minimum of three years.	The bullet in the DEIS on page 5-10 suggesting logs would be kept for 30 days was both in error and unnecessary and has been deleted. There are numerous Navy requirements applying to the retention of various logs and other general Department of Navy record management procedures.
MMC - 11		**RATIONALE** The Commission offers the following rationale for its recommendations. **No-Action Alternative** The Marine Mammal Commission continues to believe that an action agency should use the "No-Action" alternative to represent continued activity at the same level only if those activities already have been evaluated in a previous environmental analysis. Further, a previous analysis may not be adequate for that purpose if the activities that were initially evaluated have since changed. To fulfill their purpose of fully informing decision-makers, environmental impact statements must include or at least reference evaluations of all the activities in the proposed alternatives, whether those activities are ongoing or new. A hypothetical example may help explain the shortcomings of the Navy's current approach. If the Navy initiated activities in the Gulf of Alaska 10 years ago by conducting two exercises of one type each year, it should have completed an environmental analysis of the effects of those two exercises. If, over the past 10 years, the Navy increased its activities so that it now conducts five exercises of that type and three exercises of yet another type, then an environmental analysis based on historical data would be inadequate to describe the effects of all the Navy's current activities because the historical record does not in fact reflect the current level of activity. This undermines the intent of the National Environmental Policy Act.	In accordance with CEQ guidance, the no action alternative can be “no change’ from current management direction or level of management intensity.’ Given this guidance, the Navy considered all activities it has currently conducted within the GOA ATAs as its current managed level or no action. Previously, those activities have been evaluated in individually focused NEPA or E.O. 12114 documents such as the EA and/or OEAs for the Northern Edge exercise in previous years.
MMC - 12		The Marine Mammal Commission also continues to believe that it is inappropriate for the Navy to exclude alternatives that result in a reduction in its activities in the Gulf. By doing so, the Navy essentially limits the scope of decision-making because decision-makers are not presented with information about the consequences of possible reductions in training activities. Such an approach constrains rather than empowers decision-makers to make fully informed decisions and thereby undermines the intent of the National	Please see response to AMCC - 4. Further information can be found in response to MMC – 2. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.

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		Environmental Policy Act. For those reasons, the Marine Mammal Commission recommends that the Navy revise its DEIS to ensure that (1) all activities included under the no-action alternative have been evaluated, (2) the alternatives evaluated and presented to decision-makers and the public include a reduction in activity level, and (3) the scope of decision-making is not constrained unnecessarily.	
MMC - 13		**Inconsistent Descriptions of the Alternatives and Other Errors** Certain inconsistencies, omissions, and errors in this DEIS are likely to misguide decision makers and the public and therefore warrant attention. The following are four examples of such shortcomings. • The description of the three alternatives on page E-I does not match the more detailed descriptions on page ES-9 and in the body of the DEIS. In particular, the Portable Undersea Training Range is included only in Alternative 2 on page E-1 but is included in Alternative 1 in all subsequent discussions.	This comment is duly noted. The text has been reviewed for consistency and revised.
MMC - 14		• The DEIS does not provide an adequate description of SSQ-125 (Multi-Static Active Coherent or MAC), the replacement for the SSQ-110 non-explosive sound source. Although the specific source characteristics may be classified, sufficient unclassified information must be provided to permit verification in at least a general sense of the anticipated risk posed by what is obviously going to be a very loud and widely used source in Navy training.	As indicated in the EIS/OEIS in Section 3.8.7.8, the output and operational parameters for the SSQ-125 sonobuoy (source levels, frequency, wave forms, etc.) are classified, however, additional information has been added to the former text appearing on page 3.8-135 of the EIS/OEIS to provide a general sense of the anticipated risk from use of this source.
MMC - 15		• The DEIS does not describe the specifications for the Killer Tomato target simulator. Although it appears by inference to be some kind of smoke or optical beacon, the DEIS does not describe the device or its function or identify it with an official designation (e.g., Mk~85, TALD or LUU~2B/B) so that the reader is able to seek additional information from other resources.	Basically, a Killer Tomato is a large inflated vinyl shape used for target practice. At the end of the training activity, recovery of the Killer Tomato is attempted, but is not always successful. Additional descriptive information on the Killer Tomato target has been provided in Section 3.2.1.1 of the Final EIS/OEIS.
MMC - 16		• In the next to last paragraph of page 3.8-111, the DEIS includes what we believe is a typographical error in which the word *constructed* appears in place of the apparently intended word *constricted*.	This typographic error has been corrected in the FEIS/OEIS.
MMC - 17		• In the same paragraph, the DEIS cites speculation in Tyack (2009) that beaked whales may avoid all sounds equally. Indeed, this is just speculation on Tyack's part, and he identifies it as such. The commission believes it is	Dr. Tyack has taken part in the Behavioral Response Studies specifically designed to determine the response of beaked whales to Navy sonar and therefore his speculation as an expert who has just completed this research provides valuable

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		inappropriate and unreasonable to infer that sonars pose no greater risk than other sound sources when, in fact, there's little evidence available on this subject indicates otherwise.	insight on the subject. Based on this comment, the text has been revised as follows for the first mention of this citation on page 3-38 of the DEIS: In contrast and based on observations of tagged beaked whales exposed to sonar in recent behavioral response studies, Dr. Tyack of Woods Hole Oceanographic Institute has speculated that beaked whales may be "particularly sensitive to anthropogenic sounds, but there is no evidence that they have a special sensitivity to sonar compared with other signals" (Tyack 2009). Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
MMC - 18		To ensure that decision-makers and the public are accurately informed about the activities proposed in this DEIS, the Marine Mammal Commission recommends that the Navy resolve inconsistencies, omissions, and errors in the DEIS and either reissue it or use some other mechanism to allow decision-makers and the public to review and respond to the revised information.	The Navy believes that this Final EIS/OEIS provides accurate and thorough information to the Navy's decision-maker, that Assistant Secretary of the Navy for Energy, Installations and the Environment. The Navy has responded to comments and addressed issues raised as required per CEQ regulation. Under 40 CFR §1502.9, supplemental EIS documentation should be prepared in one of two instances: 1) when there are substantial changes in the proposed action that are relevant to environmental concern or 2) there is new information relevant to environmental concerns bearing on the proposed action or its impacts. The Navy has not substantially changed its proposed action since public release of the Draft EIS/OEIS and while it has thoroughly addressed comments and concerns raised, there has not been a significant new circumstance or new information relevant to the environmental concerns that would require preparation of a supplemental EIS/OEIS at this time.
MMC - 19		**Cook Inlet Beluga Whales** The Navy excludes consideration of Cook Inlet beluga whales from analysis in the DEIS. It justifies this exclusion by citing a 1995 Air Force environmental impact statement as the appropriate document for analysis of this stock. However, the Air Force environmental impact statement does not contain an analysis of effects of aircraft noise on	The Navy will not add analysis of the area because the Cook Inlet is located far from the proposed action and not within the area for consideration of impacts. By the definition of what constitutes a Cook Inlet beluga whale, none of these endangered species should occur anywhere near the TMAA or within the Gulf of Alaska. As depicted on Figure 1-1, the nearest shoreline at Kenai Peninsula is located approximately

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		beluga whales in Cook Inlet and, even if it did, that analysis would be out of date. Since preparation of the 1995 statement, the Navy appears to have changed the number of aircraft and associated traffic patterns as part of an increase in joint activities with other armed forces, as noted in the current DEIS. Furthermore, since preparation of the 1995 statement, the Cook Inlet beluga whale stock has declined markedly to approxin1ately 300 to 400 individuals, has been designated as depleted under the Marine Mammal Protection Act, and has been listed as endangered under the Endangered Species Act. Thus, neither the 1995 statement nor the DEIS under consideration provides adequate analysis of the potential effects of the proposed activities on this endangered beluga whale stock. The Marine Mammal Commission considers this a serious oversight and recommends that the Navy withdraw the current section of the DEIS dealing with Cook Inlet beluga whales, conduct the essential analysis of effects on this endangered stock, and reissue at least that section of the amended DEIS.	24 nm (44 km) north of the TMAA's northern boundary and the nearest boundary for the Cook Inlet beluga whale habitat is beyond that distance. The approximate middle of the TMAA is located 140 nm (259 km) offshore, far from the Cook Inlet. Additionally, when Navy aircraft do operate from inland military bases, their activities and operations are conducted in accordance with established operating procedures as outlined by those installations, and not by the Navy. Furthermore, Navy activities operating from those bases and installations are covered under separate, approved environmental documents developed by those particular bases and installations.
MMC - 20		**Other Species or Stocks of Special Concern** As it did in its 22 April 2008 letter, the Marine Mammal Commission also recommends that the Navy provide explicit and detailed descriptions of the measures that will be used to avoid risks to certain species or stocks of special concern. These include the eastern population of North Pacific right whales, which has been reduced to fewer than 100 individuals and is vulnerable to disturbance and vessel strikes (based on data from the closely related North Atlantic right whale).	Please see response to MMC – 7.
MMC - 21		Cook Inlet beluga whales were mentioned previously in this letter. Although outside the Navy's designated operating area, they are exposed to increased activity at Elmendorf Air Force Base and possibly other joint service exercises in Cook Inlet and coastal areas within the stock's range.	Please see response to MMC – 19.
MMC - 22		Steller sea lions, AT1 killer whales in and around Prince William Sound (although occasionally ranging more widely), sperm whales, humpback whales, fin whales, and sei whales also were mentioned in our 22 April 2008 letter.	This comment is duly noted.

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MMC - 23		The Commission concurs that sea otters are unlikely to enter the Navy training range area due to the distance from shore.	This comment is duly noted.
MMC - 24		**Habitat Analyses** With regard to marine mammals, the habitat analyses in the DEIS focus almost entirely on areas designated as critical habitat for those species that are listed as endangered or threatened under the Endangered Species Act. Such areas clearly are important and warrant extra protection, but they also are insufficient in two important respects. First, critical habitat for listed species often is poorly understood, so key habitat areas for those species may not be included. For example, critical habitat for the North Pacific right whale includes two areas, one in the southeastern Bering Sea and one off Kodiak Island in the Gulf of Alaska. The right whales that use these two areas are not thought to represent separate populations; rather, they likely move back and forth between the Gulf (and other areas of the North Pacific) and Bering Sea through certain important passes in the Aleutian Islands (e.g., Unimak, Akutan, Umnak, and Sequam Passes). These areas also may be vital to protect as they must funnel or concentrate the whales during their seasonal movements. Second, a number of species in the Gulf area are not listed under the Endangered Species Act but still use and depend on specific habitat. In fact, the records of marine mammal habitat use in the Gulf of Alaska are extensive, dating back to the 1800s. For example, northern fur seals appear to use and depend on offshore areas south of the Yakutat area. C. H. Townsend described the use of this "Fairweather Sealing Ground" and other important seal habitat in the late 1800s based on records of pelagic seal harvests. Both pinnipeds and cetaceans use the Gulf extensively. More recently, much of this information is being collected and archived and is available for management purposes. Products from the OBIS SEAMAP are available from a Web-based data archive, which also comes with a toolkit for analysis. In fact, the Navy notes on page 1-6 that the Gulf of Alaska is a complex system of shelf edges, canyons, seamounts, and freshwater intrusions, all features that are of great relevance and attractive to marine mammals and other critical ecosystem components. Although this statement generally is correct, a thorough review of existing data on marine	The Navy is aware of the information with regard to right whales and notes that the TMAA does not overlap with the Bering Sea nor the Aleutian Islands (including the passes or corridors between the Bering Sea and the GOA). With respect to other marine mammal movements (ESA and non-ESA species) within the GOA and/or within the TMAA, the Navy has made use of the best available science, which includes a review of records including historic distribution. This material is presented in Chapter 3 of the FEIS/OEIS. Chapter 4 includes a cumulative analysis of all past, present, and reasonably foreseeable future Navy and non-Navy activities. In addition, the MMPA LOA application includes an analysis on habitat effects (water quality, sound, and vessel movements) from Navy activities for ESA and non-ESA marine mammals. This information is also summarized in Chapter 3 of the FEIS/OEIS. Finally, the Navy has reviewed the OBIS SEAMAP website. While the website is a useful tool for providing incidental sighting information (which over time will provide distribution data), it does not provide any additional information with regard to active habitat use of the TMAA, densities, or frequency of use of certain areas.

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		mammal distribution and movements in the North Pacific would give the Navy much more insight into habitat use and the kinds of measures that might be needed to protect that habitat.	
MMC - 25		With that in mind, the Marine Mammal Commission recommends that the Navy expand the description of marine mammal habitat use in the Gulf of Alaska by reviewing the considerable body of information on species-specific distribution and movement patterns obtained from whaling records, scientific research, and other sources over the past century. The Commission recognizes that this represents a considerable amount of work, but we note that the thorough literature research already completed for the "Affected Species" portions of the DEIS will probably also provide most of the information needed to define and plot the typical habitats used by each species and then factor that information into an analysis of places of special concern.	The Navy does not believe that historical whaling or seal hunting records have any relevance to determining an assessment of effects from training given the overwhelming impacts to populations of marine mammals as a result of commercial whaling and as a result of industrialized fishing in the Gulf of Alaska impacting available prey species. Emergent science regarding habitat mapping, such as the focused ground-breaking efforts being undertaken by the NMFS SWFSC make it apparent that accurate predictive mapping for the Gulf of Alaska is many years away from having adequate data to allow identification of specific locations as habitat for the individual species currently using GOA or the TMAA as part of their range.
MMC - 26		**Effectiveness of Proposed Mitigation Measures** The Marine Mammal Commission repeats its now frequent recommendation that the Navy evaluate the effectiveness of its monitoring and mitigation measures. Performance tests for monitoring and mitigation measures are both technically feasible and economically reasonable. Such tests could either strengthen the Navy's position that its existing measures are adequate or, more likely, point toward steps needed to improve them. Both outcomes would provide useful information for managers responsible for ensuring the protection of marine mammals and their habitat. The Navy subjects all tactical systems to performance evaluation and doing so with its environmental systems also is necessary for the Navy to meet its commitment to good environmental stewardship.	As presented in Section 5.2.1.3, the Navy is committed to implementing a monitoring program of research and one of the areas of investigation will be to evaluate, with NMFS in a cooperating role, the effectiveness of the monitoring and mitigation measures. Additionally, please see response to AMCC – 7 regarding monitoring reports.
MMC - 27		**Retention of Vessel Logs and Records** The DEIS proposes (page 5-10) that logs and records relevant to marine mammal sightings and mitigation efforts, and other critical environmental data will be destroyed after 30 days. The Marine Mammal Commission believes that destruction of such records is entirely contrary to efforts by the Navy, the regulatory agencies (primarily the National Marine Fisheries Service), the Marine Mammal Commission, and all parties interested in better characterization of interactions between Navy operations and marine	The bullet in the Draft EIS/OEIS on page 5-10 suggesting logs would be kept for 30 days was both in error and unnecessary and has been deleted. There are numerous Navy requirements applying to the retention of various logs and other general Department of Navy record management procedures.

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		mammals. Navy activities pose a variety of risks to marine mammals including, but not limited to, those emanating from the introduction of noise (e.g., sonar), blasting (e.g., ship-shock trials, weapons testing and training), and ship strikes (e.g., especially those that involve endangered large whales). Records of Navy interactions with marine mammals are critical to characterizing those risks, evaluating the efficacy of monitoring methods, evaluating the utility of mitigation measures, and identifying alternatives for avoiding unnecessary risks. To understand the effects of Navy operations, investigators must be able to reconstruct the circumstances surrounding events such as those that occurred in Haro Strait in 2003, Haro Strait in 2004, and Hanalei Bay in 2004. Destruction of vital Navy records precludes such reconstruction and undermines efforts to identify solutions that allow the Navy to conduct its exercises while ensuring that marine mammals are protected. For that reason, and because investigation of marine mammal interactions can take several years, the Marine Mammal Commission recommends that the Navy require its vessel commanders to retain vessel logs and reports for a minimum of three years. We hope that you find these recommendations and rationale helpful. Please contact us if you have any questions or wish to discuss them. Sincerely, Timothy J. Ragen, Ph.D., Executive Director	
Katherine McLaughlin - 1		Notice of Public Hearings for the Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities Thank you for the opportunity to comment on this draft EIS by the Department of Defense. As an environmental educator, a humpback whale researcher who works with NOAA on abundance and behavior patterns of these unique cetaceans, and a board member for Prince William Sound Keeper, a citizen water quality advocacy organization for Prince William Sound, the proposed actions by the department of defense are a great concern for me over the potential and real harm that will take place upon marine mammals, and for the amount of environmental damage that may be caused to the marine environment in general with the amount and type of ordinance and activity listed in the request.	This comment is duly noted.

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Katherine McLaughlin - 2		I believe the EIS submitted by the Navy is seriously flawed. It is my belief that the U.S. Navy can conduct its exercises while safeguarding the unique and precious ecosystem of the North Gulf of Alaska without jeopardizing the safety and security of our Country. For clarity and conciseness, the concerns outlined below were prepared by the NRDC, but speak for me as to my own personal concerns as well. Please include these comments in the administrative record. Sincerely. Mrs. Katherine McLaughlin, Environmental Consultant, McLaughlin Environmental Services	This comment is duly noted.
Katherine McLaughlin - 3		*The Navy estimates an extraordinary amount of spent material will result from its Preferred Alternative (Alternative 2) in the GOA, including (I) a large increase in the weight of expended materials (352,000 lbs) and (2) 10,300 pounds of expended hazardous material. The Navy uses a quirky calculation to estimate that hazardous materials would account for approximale1y 1.2 Ib per square nautical mile (assuming the materials are spread over 20% of the TMAA, and that ocean currents will rapidly disperse the expended materials, neither of which is a valid assumption).	Please see response to AMCC – 15. Please see Highland & Archibold – 2.
Katherine McLaughlin - 4		*The Navy estimates that its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 425,000 marine mammal "takes" (behavioral impacts, harassment, injury, death) every year that's over 2.125 million takes during the course of the Marine Mammal Protection Act permit it must seek from NOAA. *In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the GOA.	This EIS/OEIS uses a method for calculating exposures to underwater sound that was developed jointly by the Navy and the National Marine Fisheries Service. This method for evaluating "takes" of marine mammals is a term used to indicate the level of harassment, either A or B, under the Marine Mammal Protection Act.
Katherine McLaughlin - 5		*Nearly all of the mitigation measures that the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far-reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast moving vessels.	Chapter 5 in the Final EIS/OEIS presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events at sea in the TMAA. As detailed in that section of the EIS/OEIS, the mitigation measures involve much more than a sonar "safety zone", make use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. The mitigation measures presented in the EIS/OEIS were developed in coordination with NMFS biologists and scientists to determine which mitigation measures would be both effective and still allows for

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			the Navy to meet the operational needs for realistic training. The Navy's mitigation measures are designed to minimize impacts. It is recognized that not all marine mammals will be present at the surface and/or detected visually and not all marine mammals will be vocalizing and thus detectable by passive acoustics. The mitigation measures are effective at limiting some marine mammals exposures to high levels of sound, just as they were designed to do.
Katherine McLaughlin - 6		*The Navy has not proposed to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife. *For example, no protection areas are proposed for harbor porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the for endangered humpback whales and blue whales, which gather to feed in the TMAA~ for the critically endangered North Pacific right whale, who's critical habitat is directly adjacent to the TMAA; or for any other species or habitat.	The boundaries of the TMAA were adjusted to avoid the designated Critical Habitat for Steller sea lions. As presented in Section 3.8 and depicted on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA and not directly adjacent to it as stated in the comment. In addition, gray whales and harbor porpoise will generally be found near the coastal areas whereas the closest point of the TMAA is over 12 nautical miles from the nearest coast line. While blue whales could be present in the TMAA, the best available science indicates their presence will be rare in the area and it is therefore unlikely that Navy training activities would occur when they are present. As provided in Section 5, mitigation measures will be implemented as appropriate whenever marine mammals are detected and regardless of their location. In this manner, Navy mitigation measures will afford the maximum protection to all marine animals, regardless of the species or area. In addition, the concept of geographical limitations is inconsistent with the requirements for training in the TMAA. It would be impractical to train while attempting to avoid geographic protection areas, and would certainly remove the realism needed for accomplishing this critical training.
Katherine McLaughlin - 7		With regard to our specific concerns/question, we obviously have huge concerns with the impacts of the Navy's proposed increase in training, including: *The Navy does not properly analyze environmental impacts. For instance, it completely disregards the serious impacts its sonar training will have on the critically endangered North Pacific right whales, whose critical habitat is only 12 nautical miles from the TMAA or the endangered gray whales, which migrate through the TMAA.	As presented in Section 3.8 and depicted on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA. In addition, gray whales have largely recovered, are no longer considered endangered, and will generally be found near the coastal areas whereas the closest point of the TMAA is over 12 nautical miles from the nearest coast line.
Katherine McLaughlin - 8		*The Navy underestimates the number of marine mammals (and fish) that will be harassed, injured and killed because it simply does not have the density estimates needed in order	Please see response to AMCC - 8.

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		to accurately make this determination. The National Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. See 40 C.FR § 1502.22(a). Here, the Navy failed to obtain data that is essential to its analysis. The Navy itself admits that it has no density estimates for endangered blue whales, North Pacific right whales, and sei whales. In addition, there are simply no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in the GOA Despite the lack of survey/density data, the Navy simply estimates that only 1 blue whale, 1 North Pacific right whale and 4 sei whales may be harmed by its use of sonar because of the "rareness" of those whales. NEPA requires more. It requires these surveys to be completed and included in the impacts analysis.	
Katherine McLaughlin - 9		*In addition, the Navy's acoustics impact analysis ignores scientific studies contrary to its interests and uses methodologies not supported by the scientific community. Thus. the thresholds it sets for permanent injury, temporary injury (hearing loss) and behavioral change (which we would argue are too high and thus completely underestimate the actual number of wildlife that will be impacted) are invalid as a matter of science. For instance, in setting its thresholds at 195 dB for harassment and temporary injury and 215 dB for permanent injury and death, the Navy ignores a 2004 study by Novacek et al which found that right whales respond to mid-frequency sound below 140 dB (the sound caused them to stop eating and ascend rapidly to just below the surface, making them extremely vulnerable to ship strikes).	The study referenced (by Nowacek et al. 2004) on right whales in the Atlantic exposed those whales to an sound designed to be an "alert stimuli" and was nothing like Navy sonar or any other Navy sound source. The "alert stimuli" signal was an 18 min exposure consisting of three 2-minute signals played sequentially three times over. The three signals had a 60 percent duty cycle and consisted of: (1) alternating 1-sec pure tones at 500 Hz and 850 Hz; (2) a 2-sec logarithmic down-sweep from 4,500 Hz to 500 Hz; and (3) a pair of low (1,500 Hz)-high (2,000 Hz) sine wave tones amplitude modulated at 120 Hz and each 1-sec long. The purposes of the alert signal were (a) to provoke an action from the whales via the auditory system with disharmonic signals that cover the whales estimated hearing range; (b) to maximize the signal to noise ratio (obtain the largest difference between background noise) and c) to provide localization cues for the whale. Five out of six whales reacted to the signal designed to elicit such behavior.
Katherine McLaughlin - 10		*The Navy's cumulative impacts analysis is inadequate. Chapter 4 of the DEIS simply lists projects that could have potential cumulative~00 the Northwest Range without actually analyzing what those impacts will be.	Chapter 4 does not list "projects" but describes in detail all activities, regardless of by whom, taking place in the TMAA in the Gulf of Alaska; reference to the "Northwest Range" is not clear in comment. For the purposes of determining cumulative effects in this chapter, the Navy reviewed environmental documentation regarding known current and past Federal and non-Federal actions associated with the resources analyzed in

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			Chapter 3. Additionally, projects in the planning phase were considered, including reasonably foreseeable (rather than speculative) actions that have the potential to interact with the proposed Navy action.
Katherine McLaughlin - 11		*The Navy's alternative analysis is also inadequate. The Navy only presents three options - maintain the status quo, add more training, or add even more training. It does not consider - or blithely dismisses - any other alternatives, some employed by the Navy itself in other training exercises and ranges.	The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027). Alternatives 1 and 2 discuss the increase from these levels. This is the approach properly taken in developing alternatives for the EIS/OEIS. (See #3 of CEQ's Forty Most Asked Questions). The Navy has discussed all alternatives that were considered but eliminated in Section 2.3.2 and the consideration of the no-action alternative, alternative 1, and alternative 2 within Chapters 3 and 4 ensures the Navy's compliance under NEPA.
Katherine McLaughlin - 12		*Finally - and most critically - the Navy does not set forth adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual monitors. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." (For instance, studies show that visual monitoring only spots about 5% of marine mammals. Statistically, a 5%"success" rate clearly does not cut it) The Navy's refusal to employ better mitigation measures is astounding, because it has used more protective measures during previous training. As NRDC discovered during previous litigation against the Navy (and as our recent settlement agreement has allowed us to make public), the Navy bas adopted, during previous exercises, some of the same mitigation measures we have repeatedly beseeched it to employ and which it now claims it cannot employ. These measures include siting exercises beyond the continental shelf and Gulf Stream, relocating exercises out of important habitat and to avoid certain species, and using a technique called "simulated geography" to avoid canyons and near-shore areas on at least three of its major ranges. It also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time. Although in Chapter 5 of the DEIS the Navy goes to some pain to describe "alternative mitigation measures considered but eliminated" - primarily for "training effectiveness" reasons - its previous	Please see response to AMCC – 7.

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		adoption of the exact same measures belies its argument The Navy's claim that it cannot implement more protective mitigation measures is therefore completely disingenuous.	
National Data Buoy Center - 1		[Graphic attached] Amy (Burt), NDBC has identified the buoys/moorings that are potentially in the GOA exercise operating area. The attached graphic lists these stations, positions and watch circle radii that need to be avoided. Additional information is contained on our website (http://www.ndbc.noaa.gov/) but please don't hesitate to contact me if you have any questions. Best regards, Craig	Thank you for the graphic and the website. The Navy is aware of the NDBC DART buoys and always deploys with the latest NOAA charts. The location of the buoys and the watch circle radii will be observed by the Navy during its activities in the TMAA.
National Data Buoy Center - 2		Amy, Thank you for providing the National Data Buoy Center (NDBC) this information. We were not aware of the proposed naval training exercise in the GOA. I ask that you include statement that they need to avoid interference with The National Data Buoy Center's DART (Deep-ocean Assessment and Reporting of Tsunamis) and our automated weather reporting buoys and moorings in the exercise area. These networks provide critical weather and tsunami warning data to the American public. For specific locations of the buoys/moorings in this area, please refer to http://www.ndbc.noaa.gov/. We will also provide this information to the Navy contact you provided below. Best regards, Craig	Please see response to National Data Buoy Center - 1.
Native Village of Afognak		January 22nd, 2010 ATTN: Mrs. Amy Burt - Gulf of Alaska EIS/OEIS project Manager 1101 Tautog circle, Suite 203 Silverdale, WA 98315-1101 Department of the Navy: On behalf of the Native Village of Afognak, a federally recognized tribe of the Kodiak Archipelago, whose mission is to protect our traditional use areas of our tribal members, we are writing in response to the Draft Environmental Impact Statement for Navy Training Activities in the Gulf of Alaska. We would like to state that we do not support activities that may adversely affect the marine life in the proposed TMAA. Not only do our members rely on the ocean for subsistence, but also many make their living from the ocean. In closing, we understand the importance of the Navy being prepared, but not at the expense of our marine life and our	This comment is duly noted. Please note, use of the words "may adversely affect" in the EIS/OEIS are specific to the requirements of the Endangered Species Act and this finding ("may adversely affect") is used when there is any potential that a "Threatened" or "Endangered" species may be present in an area and the activities cannot be proven to be beneficial. The finding does not indicate that all marine life in the TMAA will be adversely affected or that any resulting effects would be significant. As presented in Chapter 3.12 of the EIS/OEIS, there will be no adverse impacts to commercial/recreational fishing, subsistence fishing, civilian access, or tourism as a result of the Preferred Alternative.

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		ocean environment. The Native Village of Afognak strongly supports the No Action alternative. Sincerely, Melissa Borton, Tribal Administrator	
Native Village of Eyak - 1		Attn: Mrs. Amy Burt - Gulf of Alaska EIS/OEIS Project Manager Re: Comments on Gulf of Alaska Navy Training Activities EIS/OEIS Dear Mrs. Burt, I am writing on behalf of the Native Village of Eyak (NVE) to comment on the Gulf of Alaska Navy Training Activities EIS/OEIS. NVE is a federally recognized tribe with our traditional use area primarily in the Prince William Sound, the Copper River, and the Gulf of Alaska. We are based in Cordova, Alaska, where most of our members currently reside. Since Cordova is an isolated rural community accessible only by air or water, the cost of living is extremely high. For that reason, the majority of our people rely heavily on subsistence hunting, fishing, and gathering for their survival. Consequently, it is imperative that we manage the environment and aquatic resources in the most sustainable and judicious manner. The health and productivity of our environment is in direct correlation with the health and productivity of our community. The Native Village of Eyak supports the mission of the Navy and the need for readiness training. However, we are very concerned about the North Pacific and Gulf of Alaska ecosystems and encourage the Navy to take every possible precaution to protect this environment. The Gulf of Alaska and Prince William Sound are very important parts of our traditional homeland. NVE deems it vitally important to ensure that the Navy training activities do not adversely impact our aquatic resources. NVE has several concerns in relation to the training activities.	This comment is duly noted.
Native Village of Eyak - 2		The proposed activities would release a substantial amount of hazardous materials into the marine environment. While the draft EIS contains information on the hazardous content and the pounds of hazardous materials in the individual weapons expended under each alternative, the FEIS should include a table listing the specific content and amounts of the hazardous materials contained in the total expended materials under each alternative.	The total amount of expended and hazardous materials for each alternative is summarized in Tables 3.2-10, 3.2-14, and 3.2-19. The hazardous constituents of each type of ordnance are listed in Section 3.2.1.1. The amount of each hazardous constituent is an approximation based on the best information available. The exact amount of each hazardous constituent in each piece of ordnance varies. For example (pg. 3.2-6 of the

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			EIS/OEIS), "Based on standards established by American Society for Testing and Materials International, each steel bomb body or fin also may contain small percentages of carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, molybdenum, vanadium, columbium, or titanium, although typically present at less than 1 percent by weight." Section 3.2 identifies the total amount of hazardous materials for each ordnance type, and possible hazardous constituents when information was available. The effects of all expended materials would be equivalent to the sum of individual effects because of the large area in GOA, the low areal density of expended materials, and the low percentage of hazardous materials (about 3 percent of expended materials would be considered hazardous).
Native Village of Eyak - 3		The EIS states that releasing individual expended materials would not have a significant effect on the environment, but does not mention whether the cumulative effect of adding those contaminants into the marine environment was analyzed. Release of toxic substances in the water may be quickly diluted; however, some toxic substances have the potential to bioaccumulate in the food chain. Will the Navy be able to ensure that our subsistence foods will still be safe to eat?	The Cumulative effects of expended materials have been analyzed in Section 4.2.2 of the Final EIS/OEIS. Additionally, the Navy's analysis shows that releases of expended materials from the Proposed Action (through leaching and direct release) would not achieve the levels of concentration that would harm biological resources as described in Section 3.2, Expended Materials. The majority of expended materials used in the Proposed Action are heavy objects that will sink to the bottom of the water column. Encrustation and burial in the substrate prevent leaching from expended materials, thus further avoiding bioaccumulation. Any leaching that occurs will be diluted by ocean currents in the large and dynamic open ocean environment of the GOA. For further discussion on bioaccumulation, please see response to CDFU – 9.
Native Village of Eyak - 4		The Gulf of Alaska supports habitats of threatened and endangered populations of marine mammals and salmon. These populations have already been impacted by the Exxon Valdez Oil Spill and have just recently begun to recover. Marine mammals and fish may be physiologically or behaviorally affected as a result of the proposed activities. The effects of training activities could result in direct physical injury, death, or failure to reach the next developmental stage.	The proposed actions should not have any effect on populations of marine mammals (see Section 3.8) or salmon (see Section 3.6.1.1) in the Gulf of Alaska and while it may adversely affect those species, it should not impact their recovery. Please note, the words "may adversely affect" in the EIS/OEIS are specific to the requirements of the Endangered Species Act and that finding is used when there is any potential that a "Threatened" or "Endangered" species may be present in an area and the activities cannot be proven to be beneficial. The finding does not indicate that any resulting effects would be significant. Additionally, the proposed training activities should not result in direct physical injury, death, or failure to reach the next developmental stage for any marine mammals and should not have an impact on populations of

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			fish. While individual fish may be harmed if they co-occur with some activities that use explosives, this should not have any impact on the overall population. Please see Section 3.6.2 for potential impact discussion for Fish.
Native Village of Eyak - 5		Elevated concentrations of certain chemicals can cause adverse effects on aquatic biota including reduced survival, impaired reproduction, and reduced growth. No long term population studies have been conducted for previous Naval training exercises. Will the Navy be able to ensure that their training activities will not affect the long term productivity of marine mammals and fish populations?	Please see response to Native Village of Eyak – 3. Additionally, there have been no long-term population studies on fish or marine mammals following Navy training activities in other training areas because there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of marine mammal and fish populations.
Native Village of Eyak - 6		We appreciate the opportunity to comment on the draft EIS/OEIS and request that the Native Village of Eyak be kept informed on environmental issues and job and business opportunities with this exercise on a government to government basis. Sincerely, Native Village of Eyak Traditional Council, Robert Henrichs, President *10,000 years in our Traditional Homeland, Prince William Sound, the Copper River Delta, & the Gulf of Alaska*	This comment is duly noted.
Natural Resources Defense Council (NRDC) - 1		**January 4, 2010** **NATURAL RESOURCES DEFENSE COUNCIL** *Re: Petition for Extension of Public Comment Period on the Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities* Dear Mrs. Burt: On behalf of the Natural Resources Defense Council ("NRDC") and our 1.3 million members and activists, I am writing to petition the Navy for an extension of the public comment period on its Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities ("GOA DEIS"). Notice of the comment period was published in the Federal Register on December 11, 2009. Sec 74 Fed. Reg. 65761. The public has been given only 45 days - over religious and New Years holidays - to submit comments by January 25, 2010 on over 900 pages of dense information. In light of the voluminous information provided by the Navy in justifying its plans and the extensive range of activity proposed, we respectfully request an extension to submit written comments or at least 30 days until February 25, 2010. Such	Please see response to AMCC – 16.

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		an extension is necessary to fully protect the public interest by giving citizens some time to thoroughly analyze the Navy's proposal and submit comments on the critical issues raised therein.	
NRDC - 2		The Navy's GOA DEIS raises many issues that the public has never been able to address before. Notably, some of the Navy's activities may take place in critical habitat for North Pacific right whales and may affect humpback whale feeding grounds and gray whale migration routes. The public, as well as the scientific community needs sufficient time to identify, analyze, and comment on the scope of the proposed activities and on the Navy's analysis thereof. The Navy appropriately extended its initial comment periods for the Northwest Training Range Complex DEIS and its Undersea Warfare Training Range DEIS, thus providing an additional 30 days for the public to comment due to the sheer size of, and the many issues raised in, those DEISs. We believe at the very least that a similar extension is warranted here. Therefore, we strongly urge you to grant this petition and extend the comment period. As always, we would welcome discussion with the Navy at any time. Very Truly Yours, Taryn G. Kiekow Staff Attorney, Marine Mammal Protection Project, Natural Resources Defense Council	As shown on Figure 3.8-1, none of the proposed activities will take place in the designated Critical Habitat for the North Pacific right whale. Potential affects to right whale, humpback, and gray whales from Navy training are not new issues given the presentation of these issues in previous Range Complex EIS/OEIS such as the Hawaii Range Complex EIS/OEIS completed in 2008. Regarding your request for a comment period extension, please see response to NRDC – 1.
NRDC - 3		**January 25, 2010** **Natural Resources Defense Council** *Re: Draft Environmental Impact Statement/Overseas Environmental Impact Statement for the Gulf of Alaska Navy Training Activities* Dear Mrs. Burt: On behalf of the Natural Resources Defense Council ("NRDC"), Alaska Community Action on Toxics, Alaska Marine Conservation Council, Center for Biological Diversity, Cook Inletkeeper, International Fund for Animal Welfare, Juneau Group Sierra Club, Kodiak Audubon, North Gulf Oceanic Society, Oceana, Ocean Futures Society, Prince William Soundkeeper, Sierra Club Alaska Chapter, The Kodiak Gray Whale Project, Turning the Tides, and Jean-Michel Cousteau, and our millions of members and activists, thousands of whom reside in Alaska, we appreciate the opportunity to submit comments regarding the Navy's Draft Environmental Impact Statement/ Overseas Environmental	This comment is duly noted.

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		Impact Statement ("DEIS") for its Training Activities in the Gulf of Alaska ("GOA"). See 74 Fed. Reg. 65761 (Dec. 11, 2009). Please include these comments and attachments in the administrative record.[1] While our organizations recognize the Navy's important role in ensuring national security, we also value the security a clean and healthy environment provides. National security and environmental integrity are not mutually exclusive, and we encourage the Navy to train in a way that protects the valuable natural resources in the GOA. We are profoundly concerned, however, that Navy's DEIS falls short of ensuring such protection. As you are aware, the Navy's preferred alternative (Alternative 2) would dramatically increase the amount of training in the Temporary Maritime Activity Area ("TMAA") in the GOA between April and October every year. _____ [1] We are aware that comments may be submitted separately by government agencies, individual scientists, environmental organizations, and the public. All of these comments are hereby incorporated by reference.	
NRDC - 4		The TMAA extends across 42,146 square nautical miles across the GOA south of Prince William Sound and east of Kodiak Island. The Navy plans to introduce - for the first time - extensive sonar training in the GOA[2]. Its preferred alternative would use many different sources of active sonar, totaling over 1,160 hours of sonar use every year. DEIS at 3.8-146. These training exercises would also employ a battery of other acoustic sources and explosives detonations in ocean surface and undersea areas, special use airspace, and training land areas. In addition, the Navy plans to use a Portable Undersea Tracking Range, add a second carrier strike group exercise and conduct sinking exercises in the TMAA. DEIS at ES-I. _____ [2] The OEIS states that no active mid-frequency sonar is used in the GOA (or at least from exercises involving carrier-strike groups). OEIS at ES-II (describing the no Action Alternative). While it may be true that scripted exercises during Northern Edge or other major events do not currently involve mid-frequency sonar, that does not mean that individual units do not use sonar opportunistically while in the area, or that sonar is not used for sustainment training, unit-level exercises, equipment testing or calibration, or other purposes. We request that the Navy review activity over a reasonable time	Regarding the footnote, please note that there have been no ASW exercises involving use of mid-frequency sonar in previous Northern Edge Exercises (incl. 2004/09). Additionally, in reference to the stranded marine mammals found in the summer of 2004, see Section 3.8.4.2 and Appendix F of the EIS/OEIS. Please be aware that the referenced strandings discovered in 2004, which including two beaked whale strandings weeks before the exercise began and five discovered over a 33 day period along 1,600 miles of coastline after the exercise, have not been considered an Unusual Mortality Event by NOAA Fisheries (see Appendix F, Table F-2). As such, expenditure of resources to further investigate these strandings is not warranted. Regarding "opportunistic" sonar usage – Navy exercises and the participants are planned well in advance of any exercise commencing. As stated above, there have been no ASW exercises involving the use of mid-frequency sonar in previous Northern Edge exercises. As such, there would be no reason for a Navy asset to use active sonar, unless it was a safety related issue. In that situation, sonar use would not be considered training. However, given that the majority of training that occurred during those timeframes in the GOA was

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		period to establish an actual baseline for analysis. In previous requests to the Navy NRDC asked the Pacific Fleet review its logs for active sonar use occurring in the GOA between June 1, 2004 and July 20, 2004 - which corresponded to an unusual mortality of beaked whales in the area - and indicate in its OEIS whether mid-frequency sonar was used. The Navy did review the 2004 event in Appendix F of the OEIS and concluded that "[t]here was no ASW component to the exercise... There were no events in the Alaska Shield Northern Edge exercise that could have caused or been related to any of the strandings ... " OEIS at F-27. As noted above, just because the exercises during Northern Edge did not involve mid-frequency sonar does not mean that individual units were not using sonar opportunistically or for other purposes. We request that the Navy disclose whether ANY sonar is or has been used in the GOA over a reasonable time period (at least as far back as 2(04), including for sustainment training, unit-level exercises, equipment testing or calibration, or any other purpose.	in open water, without submarine assets involved, it is highly unlikely that "opportunistic" sonar was used in training.
NRDC - 5		The Navy also plans to abandon at least 352,000 pounds of spent material (both hazardous and non hazardous) in the TMAA every year, including 360 bombs, 66 missiles, 644 targets and pyrotechnics, 26,376 gunshells, 11,400 small caliber rounds, and 1,587 sonobuoys. Over 10,300 pounds of this expended material is hazardous. DEIS at ES-15 to 28; 3.2-28 to 34; 3.6-34.	Please see response to Faust & Bailey – 2.
NRDC - 6		These proposed training activities would pose significant risk to whales, fish, and other wildlife that depend on sound for breeding, feeding, navigating, and avoiding predators-in short, for their survival. Under Alternatives 1 and 2, the Navy would employ mid-frequency active sonar, which has been implicated in mass injuries and mortalities of whales around the globe.3 The same technology is known to affect marine mammals in countless other ways, inducing panic responses, displacing animals, and disrupting crucial behavior such as foraging. By the Navy's own estimates, sonar training exercises from its preferred alternative will result in more than 425,000 marine mammal "takes" (behavioral impacts, harassment, injury) every year - over 2.125 million takes during the course of the permit it must obtain under the Marine Mammal Protection Act. DEIS at 3.8-148. In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the TMAA. DEIS at 3.8-1 to 4. The GOA training activities would also affect fisheries and essential fish habitat-and release a large amount of hazardous and expended materials into the waters. See	The Navy shares your desire to preserve marine life. The Navy believes that the proposed training will not pose a significant risk to whales, fish, and other wildlife given that these same activities have been conducted for many years in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring reports available at available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. A integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. In addition, the Navy implements protective measures during its training events as developed with NMFS as a cooperating agency. Please see Appendix F regarding a review of sonar related stranding events. The Navy will continue to implement the monitoring and research programs where training has been occurring to determine if there are determinable impacts as a result of those activities and will do so in the TMAA associated with future training occurring there. The Navy will continue to be a leader in funding of research to

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		Appendices A and B for a detailed discussion of impacts. 3 Military sonar generates intense sound that can induce a range of adverse effects in whales and other species - from significant behavioral changes to injury and death. The most widely reported and dramatic of these events are the mass strandings of beaked whales and other marine mammals that have been associated with military sonar use. A brief summary of the stranding record appears in Appendix B.	better understand the potential impacts of Navy training activities and to operate with the least possible impacts while meeting training requirements.
NRDC - 7		The National Environmental Policy Act ("NEPA") requires the Navy to employ rigorous standards of environmental review, including a full explanation of potential impacts, a comprehensive analysis of all reasonable alternatives, a fair and objective accounting of cumulative impacts, and a thorough description of measures to mitigate harm. Unfortunately, the DEIS released by the Navy falls far short of these mandates and fails to satisfy the Navy's legal obligations under NEPA. Before issuing a final EIS, the Navy must revise the environmental impacts, alternatives, cumulative impacts and mitigation analysis in the DEIS (described in detail in Appendix A). It must also fully address the considerable scientific record that has developed around sonar and whale injury and mortality, and adjust its acoustic impacts analysis and assessment model accordingly (discussed in Appendices B and C).	This comment is duly noted. The Navy agrees and in fact complies with all applicable environmental laws, including NEPA. As such, the Navy has developed this EIS/OEIS including the pertinent sections you cited to meet those purposes as well as others. Please see Chapter 2 for a description of the proposed actions and alternatives including selection criteria and alternatives not considered. Please see Chapter 3 (specifically Section 3.6 on Fish and Section 3.8 on marine mammals) with regard to affected environment and environmental consequences. Please see Chapter 4 with regard to cumulative impacts. Please see Appendix F on cetacean strandings with regard to a full review of the scientific record concerning marine mammal strandings and sonar use. Please see Appendix D on a discussion of the acoustic impact modeling approach, which addresses the scientifically established criteria for injury and mortality.
NRDC - 8		A few additional concerns are highlighted below. One of our primary concerns is the paucity of survey data necessary to estimate marine mammal density or distribution. Without these estimates, it is impossible to adequately evaluate the impacts on marine mammals or to estimate harm, as required by NEPA. Nor can the Navy support its environmental analysis and take estimates.	Section 3.8.2 in the DEIS discusses the density estimates used in the DEIS analysis with more detail provided in Appendix E. These estimates and the method for analysis were coordinated with National Marine Fisheries Service (NMFS) as a cooperating agency. In addition, in April 2009 the Navy funded and NMFS conducted the Gulf of Alaska Line-Transect survey (GOALS) to address the data needs for additional information. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 for full discussion on the survey.
NRDC - 9		A closely related concern is the Navy's failure to protect any area within the TMAA from sonar training activities. There is a general consensus among the scientific community that "[p]rotecting marine mammal critical habitat is ...the most effective mitigation measure currently available" to reduce	With regard to protecting marine mammal habitat, the Navy altered the boundary of the TMAA to avoid the Critical Habitat boundary established for the Stellar sea lions and the TMAA is many miles from the protective areas established for right whale, sea otter, and beluga whale; there is no designated

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		the harmful impacts of mid-frequency sonar on marine mammals.[4] Nonetheless, the DEIS does not even consider establishing any protection areas in the TMAA where sonar training would be limited or excluded. [4] See Letter from Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere to Nancy Sutley, Chair, Council on Environmental Quality dated Jan. 19,2010, available at ht1]:l/www.nrdc.orgimediaJdocs/lOOI19.pdf; see also Agardy, T., Aguilar Soto, N., Canadas, A, Engel, M., Frantzis, A, Hatch, L., Hoyt, E., Kaschner, K., LaBrecque, E., Martin, V., Notarbartolo di Sciara, G., Pavan, G., Servidio, A, Smith, B., Wang, J., Weilgart, L., Wintle, B., and Wright, A A global scientific workshop on spatio-temporal management of noise. Report of workshop held in Puerto Calero, Lanzarote, (June 4-6,2007); ECS Working Group: Dolman, S., Aguilar Soto, N., Notabartolo di Sciara, G., Andre, M., Evans, P., Frisch, H., Gannier, A, Gordon, J., Jasny, M., Johnson, M., Papanicolopulu, 1., Panigada, S., Tyack, P., and Wright. A Technical report on effective mitigation for active sonar and beaked whales. Working group convened by European Cetacean Society, (2009); OSPAR Commission, Assessment of the environmental impact of underwater noise. OSPAR Biodiversity Series, (2009); Parsons, E.C.M., Dolman, S.J., Wright, A.I., Rose, N.A., and Burns, W.c.G. Navy sonar and cetaceans: just how much does the gun need to smoke before we act? Marine Pollution Bulletin 56: 1248-1257.	marine mammal habitat in the TMAA by design. In addition, please see Section 5 detailing the Navy's standard protective measures developed in cooperation with NMFS which will provide additional protection to marine mammals detected in the vicinity of sonar training events.
NRDC - 10		Until sufficient information on the density and distribution of marine mammals is obtained - and any salient protection areas established - the Navy should not increase sonar training in the GOA. We recommend that the Navy: (1) obtain additional data on marine mammal density and distribution in the TMAA, (2) re-analyze its impacts analysis, take estimates, and alternatives and mitigation analysis accordingly, and (3) reissue its DEIS. Should the Navy proceed before obtaining sufficient density and distribution information, we believe the law requires the adoption of the No Action Alternative until sufficient information is obtained.	Section 3.8.2 and Appendix E in the EIS/OEIS discusses the density estimates used in the EIS/OEIS analysis. These estimates and the method for analysis were coordinated with National Marine Fisheries Service (NMFS) as a cooperating agency. In April 2009, the Navy also funded and NMFS conducted the Gulf of Alaska Line-Transect Survey (GOALS) to address the data needs for additional information. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 for full discussion on the survey. Previous estimates of marine mammal densities were altered based on this newly obtained information although the changes required were not substantial and largely verified the previous estimate. The information used to derive the density estimates (detailed in Appendix E) are based on the best currently available science and provide sufficient information for an informed analysis.
NRDC - 11		**The Navy Has Not Taken a "Hard Look" Under NEPA** NEPA requires that the potential environmental impacts of	The EIS/OEIS has taken a “hard look” at potential environmental consequences of the proposed action and

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		any "major Federal actions significantly affecting the quality of the human environment" be considered through the preparation of an environmental impact statement ("EIS"). Robertson v. Methow Valley Citizens Council, 490 U.S. 332,348 (1989); 42 U.S.C. § 4332. The fundamental purpose of an EIS is to compel decision-makers to take a "hard look" at a particular action - both at the environmental impacts it will have and at the alternatives and mitigation measures available to reduce those impacts - before a decision to proceed is made. 40 C.F.R. §§ 1500.1(b), 1502.1; Baltimore Gas & Electric v. NRDC, 462 U.S. 87,97 (1983); Robertson, 490 U.S. at 349. While NEPA "does not commend the agency to favor an environmentally preferable course of action," an agency may only make a decision to proceed after taking a "hard look" at environmental consequences. Sabine River Auth. v. Dep't of Interior, 951 F.2d 669, 676 (5th Cir. 1992)(internal citations omitted). This "hard look" requires agencies to obtain high quality information and accurate scientific analysis. 40 C.F.R. § 1500.1(b). It is impossible to characterize the DEIS as taking a "hard look" because of the Navy's failure to obtain information regarding marine mammal densities and distribution. The flaws stemming from this failure reverberate throughout the DEIS, most notably in the Navy's impacts analysis, take estimates and mitigation proposals.	alternatives, and provides sufficient information for careful agency decision-making. To address your concerns please see Section 3.8.2 and Appendix E in the DEIS discussing the derivation of density estimates for the analysis. The distribution information specific to species is contained in the body of Section 3.8 beginning at 3.8.1.1 and running through 3.8.5.4. In addition, an April 2009 survey of the area was conducted (the Gulf of Alaska Line-Transect Survey [GOALS]) to address the data needs for density analysis. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 for full discussion on the survey.
NRDC - 12		**The Navy Lacks Sufficient Information** NEPA requires agencies to ensure the "professional integrity, including scientific integrity" of material relied upon in an EIS. 40 C.F.R. § 1502.24. To that end, agencies must make every attempt to obtain and disclose data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. 40 C.F.R. § 1502.22(a). The Navy simply has not obtained the required information. The Navy is unable to establish densities for many marine mammal populations in the TMAA, including blue whales, North Pacific right whales and sei whales - all of which are endangered. DEIS at 3.8-2. Nor is it able to estimate the density of harbor porpoises, which are particularly vulnerable to acoustic impacts. DEIS at 3.8-3. The Navy argues that blue whales, North Pacific right whales and sei	The majority of the information the Navy used regarding marine mammals in the Gulf of Alaska comes from the National Marine Fisheries Service Stock Assessment reports as detailed in Section 3.8.2 and Appendix E of the DEIS. In 2009, the Navy did fund the Gulf of Alaska Line-Transect Survey (GOALS) to better refine the density data and those survey results have been incorporated the analysis in the EIS/OEIS. For species that are so rare they are seldom encountered at sea in the Gulf of Alaska and therefore no density information exists, estimations have been made as appropriate. Not only would the cost to identify the number of individuals of rare species present in the Gulf of Alaska be exorbitant, no amount of data would change the fundamental fact that these species are rare. As a result of being rare, any predictive modeling will result in a finding that exposures are unlikely to occur. However, in cooperation with NMFS and as detailed in Section 3.8.7.6 and Table 3.8-8, the Navy has

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		whales are "too few in number to allow for quantitative analysis," but it cannot escape its responsibilities under NEPA simply by claiming that whales are "very rare." DEIS 3.8-2, 5,9. The "rareness" and low abundance of those whales, if anything, should warrant additional monitoring (including acoustic and visual), safeguards and protections - particularly of North Pacific right whales, one of the most endangered species of whales on the planet.	accounted for the possible exposures of rare species. In addition, all marine mammals (no matter the species) will be afforded the maximum protection provided by the mitigation measures detailed in Section 5 of the EIS/OEIS.
NRDC - 13		And although the DEIS claims that blue whales are "rare" in the GOA, a 2009 study presents new evidence indicating that as the northeastern Pacific population recovers from whaling, blue whales increasingly may be returning to former GOA feeding grounds. These whales appear to be part of the same stock that is seen off of California.[5] [5] See Calambokidis J, Barlow J, Ford JKB, Chandler TE, Douglas AB. 2009. Insights into the population structure of blue whales in the eastern North Pacific from recent sightings and photographic identification. Marine Mammal Science 25 :816-832.	This reference was cited and used in the development of the Draft EIS/OEIS. The inclusion of this study suggesting that the population may be returning to former feeding areas did not, however, change the current rare status of blue whales in the Gulf of Alaska as assessed by technical experts and based on the best currently available information.
NRDC - 14		The Navy further acknowledges that the existing information for other species and habitat in the GOA is extremely "limited" and "localized." DEIS at 3.8-9. For instance, with the exception of Rone et al. (2009), none of the surveys focused on the TMAA itself - most surveyed nearshore areas outside the TMAA. DEIS at 3.8-9. In addition, some of the surveys were designed to count species other than those targeted in the density estimate.[6] Recognizing the dearth of data, the Navy did fund a targeted 10-day marine mammal line-transect survey conducted by Rone et al. in April 2009 that yielded the most direct data available on fin whales and humpback whales in the TMAA.[7] But that survey - hampered by several "challenges" including "limited survey time, a large survey area, inclement weather, and the lack of arrival of sonobuoys" [8] - is inadequate to establish abundance and density estimates for most marine mammals in the TMAA or to identify important marine mammal habitat. Despite these challenges, however, the survey encountered an "unexpectedly large number" of sightings of marine mammals.[9] This suggests that the TMAA represents rich habitat for cetaceans, particularly in continental shelf and slope waters, that requires further study. Having sufficient data is essential for the Navy to meet its responsibilities under NEPA. The	Section 3.8.2 and Appendix E of the EIS/OEIS provide a description of the methods for establishing the density of marine mammals in the area for analysis. The Navy has used the best available science, data, and analytical methodologies for determining potential impacts as developed with NMFS as the regulator. The information in the EIS/OEIS was in large part derived from NMFS latest stock assessment reports to determine the abundance and density estimates for most marine mammals in the TMAA. In addition, while it is clear that the Gulf of Alaska is, in general, important marine mammal habitat, the locations and boundaries for species specific Critical Habitat have been established and are discussed in the EIS/OEIS in Section 3.8. Additionally, CEQ regulation at 40 CFR §1502.24 requires the Navy to ensure the "professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements" and to "identify any methodologies used and make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement." Navy has met this requirement. The EIS/OEIS represents the best available science and most applicable science on species and distribution. The Navy has taken a hard look through its analysis and has considered competing and contradictory scientific research. Under 40 CFR §1502.22, NEPA allows for

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		Navy cannot issue a final EIS (nor can the National Marine Fisheries issue a Biological Opinion under the Endangered Species Act or an incidental take permit under the Marine Mammal Protection Act) without adequate information on densities and distributions of marine mammals in the TMAA. [6] For example, the Moore et al survey of gray whales was designed to measure pinnipeds. See Moore, S.E., K.M. Wynne, J. Clement-Kinney, and J.M. Grebmeier, 2007. Gray whale occurrence and forage southeast of Kodiak Island, Alaska. Marine Mammal Science 23(2):419-428. [7] See Rone, B., A. Douglas, P. Clapham, A. Martinez, L. Morse and J. Calambokidis. 2009. Cruise Report for the April 2009 Gulf of Alaska Line-Transect Survey (GOALS) in the Navy Training Exercise Area. Report issued by National Marine Mammal Laboratory and Cascadia Research. Naval Postgraduate School Tech Report # NPS-OC-09-007. [8] Id. at 15. [9] Id.	recognizing incomplete and unavailable information. Information on species density found in Tables 3.8-1 and 3.8-2 of the EIS/OEIS was compiled from NMFS Stock Assessments as well as the 2009 GOALs survey and two other vessel surveys in the GOA. Therefore, density data has been generated based on available data in coordination with technical staff from NMFS.
NRDC - 15		Until the Navy collects the necessary information, it may be significantly underestimating marine mammal densities and thereby affecting its impact analysis and take estimates. To meet its responsibilities under NEPA, Navy should sponsor a multi-year, multi-seasonal survey effort within the TMAA that can serve as a basis for both improved environmental assessment and mitigation. Based on the results of those surveys, the Navy may need to revise its alternative analysis and site at least some of its proposed exercises in lower value marine mammal habitat elsewhere in the GOA, or adopt the No-Action Alternative. Until then, the Navy's NEPA analysis remains arbitrary and capricious.	The statement that the U.S. Navy underestimates marine mammal densities is not correct. As discussed in Section 3.8.2 and Appendix E in the E/OEISIS, the density estimates used are those provided by the NMFS stock assessment reports. Also, methods used to derive densities otherwise have erred on the side of overestimation when information is not definitive for the Gulf of Alaska or the TMAA. However, the Navy will be conducting monitoring and research associated with the proposed actions as detailed in Section 5.2.1.4. In addition, the Navy has drafted an Integrated Comprehensive Monitoring Plan to coordinate research between the various training areas with regard to potential impacts from Navy training on marine species and the effectiveness of established mitigation measures. Regarding your comment about the Navy's NEPA analysis being arbitrary and capricious, please see response to NRDC – 14.
NRDC - 16		**The Navy Fails to Consider Effective Mitigation** There is general consensus that protection areas - in which the use of mid-frequency sonar would not occur - represent the most effective means currently available to reduce the impacts of mid-frequency sonar on marine marnmals.[10] The National Oceanic Atmospheric Administration ("NOAA") recently completed a review of the Navy's sonar mitigation. It concluded that "ongoing mitigation efforts, in our view,	The Navy TMAA was adjusted to avoid established Critical Habitat boundaries so the Navy did make provision for protection areas when it established the boundary of the area under consideration. Other areas, such as seamount and slope habitat conservation areas designed to limit impacts from fishing, will not be subjected to significant impacts from Navy training activities. In addition, as provided in Section 5, mitigation measures will

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		must do more" to address uncertainties and protect marine mammals.[11] NOAA emphasized the importance of habitat identification and avoidance, stating that "[p]rotecting important marine mammal habitat is generally recognized to be the most effective mitigation measure currently available."[12] Yet the Navy makes no provision whatsoever for protection areas in the TMAA. [10] Supra, note 4. [11] See Letter from Jane Lubchenco, Under Secretary of Commerce for Oceans and Atmosphere to Nancy Sutley, Chair, Council on Environmental Quality dated Jan. 19,2010, available at http://www.nrdc.orglmediaJdocs/100119.pdf [12] Id.	be implemented as appropriate whenever marine mammals are detected and regardless of their location. In this manner, Navy mitigation measures will afford the maximum protection to all marine animals, regardless of the species or area. In addition, the concept of geographical limitations is inconsistent with the requirements for training in the TMAA. It would be impractical to train while attempting to avoid geographic protection areas, and would certainly remove the realism needed for accomplishing this critical training.
NRDC - 17		Appendix A contains a detailed description of mitigation measures that the Navy can and should - adopt.	This comment is duly noted. However, please note that the U.S. Navy, in conjunction with NMFS and USFWS, has determined what mitigation it can effectively use during its training and testing activities. Through careful exploration of all mitigation measures to determine which were the most effective, the Navy has chosen the existing measures to mitigate harm to marine mammals while still being able to meet its operational needs to train for real-world conditions.
NRDC - 18		At a minimum, however, the Navy must assess the value of marine mammal habitat [13] both in the TMAA itself and the broader GOA, and protect any higher-value areas identified. [13] NOAA has committed to conduct a series of workshops to learn more about marine mammal "hotspots," particularly through available predictive models. Based on the results of these workshops, NOAA will consider additional measures to reduce harm from sonar. in future rulemakings and authorizations under the Marine Mammal Protection Act.	The Navy considered the best available science in preparation of this EIS/OEIS and is in consultation with NMFS as the regulator and a cooperating agency with regard to the proposed action and any resultant mitigation measures as conditions of anticipated authorizations under the MMPA or reasonable and prudent measures resulting from issuance of a Biological Opinion under ESA. Note that, at present, there is no established means for an "assessment of value" for marine mammal habitat, even if it was possible to define the value boundaries of marine mammal habitats, with any reasonable degree of certainty.
NRDC - 19		We recognize that predictive habitat modeling to determine potential marine mammal hotspots is hindered by the lack of survey data in the TMAA, which is why additional surveys absolutely must be undertaken before the Navy issues a final EIS. The survey data can then be used to generate a predictive habitat model upon which appropriate mitigation can be based.	As discussed in the opening paragraphs of Section 3.8, Navy recognizes that there is a lack of data with regard to some marine mammals in the Gulf of Alaska and the TMAA; however, marine mammal presence predictive modeling in the detail necessary for exercise planning is many years, if not decades, from being realized. Given the current state of knowledge, marine mammal predictive modeling is not a function of density data from any one area but is a function of the general lack of understanding for the fundamental parameters resulting in the presence of marine mammals of a

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			particular species within changing environmental conditions over seasonally lasting years and/or decades. Combined with the recovery of large whales following the end to generalized whaling and industrial fishing protections for smaller marine mammals and sea turtles, predictions of what constitutes habitat for a species will remain in flux. Until better science is developed, the Navy relies on implementation of mitigation measures, as detailed in Section 5, whenever marine mammals are encountered, providing the maximum practical mitigations no matter where marine mammals may occur.
NRDC - 20		Already there exists important marine mammal habitat that can be readily identified. The TMAA is only 16 nautical miles west of critical habitat for the highly endangered North Pacific right whale (DEIS at 3.8- 22, 23) and directly adjacent to critical habitat for Steller sea lions (DEIS 3.8-34).	Yes, the Navy recognized these areas as important and, in the case of the Steller sea lion habitat, adjusted the boundary of the TMAA to avoid that habitat.
NRDC - 21		The North Pacific right whale is among the most endangered species of cetaceans in the world. [14] Mid-frequency sound below 140 dB has been shown to disrupt foraging in right whales and cause them to ascend rapidly to just below the surface where they face a significantly greater risk of ship strike.[15] At a minimum, the Navy should establish a sufficient buffer between these critical habitats and the TMAA. [14] See. e.g., Committee on the Status of Endangered Wildlife in Canada (COSEWIC), COSEWIC Assessment and Update Status Report on the North Pacific Right Whale Eubalaena japonica in Canada (2004). [15] See D.P. Nowacek, M.P. Johnson, and P.L. Tyack, North Atlantic Right Whales (Eubalaena glacialis) Ignore Ships but Respond to Alerting Stimuli, 271 Proceedings of the Royal Society of London, Part B: Biological Sciences 227 (2004).	As discussed in 3.8.7.3, the study referenced (by Nowacek et al. 2004) on right whales in the Atlantic exposed those whales to a sound designed to be an "alert stimuli" and was nothing like Navy sonar or any other Navy sound source. The "alert stimuli" signal was an 18 min exposure consisting of three 2-minute signals played sequentially three times over. The three signals had a 60 percent duty cycle and consisted of: (1) alternating 1-sec pure tones at 500 Hz and 850 Hz; (2) a 2-sec logarithmic down-sweep from 4,500 Hz to 500 Hz; and (3) a pair of low (1,500 Hz)-high (2,000 Hz) sine wave tones amplitude modulated at 120 Hz and each 1-sec long. The purposes of the alert signal were (a) to provoke an action from the whales via the auditory system with disharmonic signals that cover the whales estimated hearing range; (b) to maximize the signal to noise ratio (obtain the largest difference between background noise) and c) to provide localization cues for the whale. Five out of six whales reacted to the signal designed to elicit such behavior, which is not how Navy sonar works. A discussion of potential impacts to North Pacific right whales and Steller sea lions from sound sources proposed for use in the TMAA is presented in Section 3.8.7 of the FEIS/OEIS. Species acoustic thresholds for the North Pacific right whale and the Steller sea lion can be found in Sections 3.8.3.4 and 3.8.3.7, respectively.
NRDC - 22		In addition, the Navy should protect feeding grounds for humpback whales and gray whale migratory routes.[16]	As provided in Section 5, mitigation measures will be implemented for gray whale and humpback whales no matter

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		[16] Gray whales migrate through this area twice a year. While they usually maintain a distance of less than 2km to the shore, they are known to move further offshore south of Kodiak Island. Peak abundance is generally in April through May for the northbound migration, and November through December for the southbound migration. In addition, some groups of gray whales form resident feeding aggregations that maintain a presence in the GOA throughout the summer feeding season off of Kodiak Island, peaking in September through November. See Moore SE, Wynne KM, Kinney IC, Grebmeier JM, Gray whale occurrence and forage southeast of Kodiak Island. Alaska. Marine Mammal Science 23:419-428 (2007).	where these species are located. Also note that the closest point of the TMAA is 22 km from shore which provides some standoff from the main feeding areas of these species and is farther than the 2 km distance from the shore that was referenced in the comment.
NRDC - 23		The Navy should also protect areas of high bathymetric relief, where there are likely to be high concentrations of beaked whales and other deep diving species.	As provided in Section 5, mitigation measures will be implemented as appropriate whenever marine mammals are detected. In this manner, the Navy mitigation measures will decrease adverse impacts in all areas. In addition, the concept of geographical limitations is inconsistent with the requirements for training in the TMAA. Seamounts or areas of bathymetric relief are often used by submarines to hide or mask their presence, requiring the need to train in that complex ocean environment. If the Navy were restricted from training near sea mounts or areas of bathymetric relief, they may be unable to do so when faced with an actual threat. It would be impractical to train while attempting to avoid all areas of "high bathymetric relief," and would certainly remove the realism needed for accomplishing this critical training.

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NRDC - 24		**Conclusion** For the reasons set forth above and in greater detail in the Appendices below and attached critique by Dr. David Bain, we urge the Navy to satisfy its obligations under NEPA and other applicable laws. To that end, the Navy should conduct multi-year, multi-seasonal surveys to obtain adequate information on densities and distributions of marine mammals in the TMAA. These surveys would serve as a basis for predictive habitat modeling and protective mitigation. Once the Navy obtains additional data on marine mammal density and distribution, it should re-analyze its impacts analysis, take estimates and mitigation measures accordingly and reissue its DEIS. Until this additional information is obtained, the Navy should only consider the No Action Alternative. Thank you for your consideration of our comments, and we welcome the opportunity to discuss this matter with you at any time. Sincerely, Taryn Kiekow, Staff Attorney	Please see responses above for details on response to this summary of previous comments.
NRDC - 25	NRDC - Appendix A - 1	**APPENDIX A** **THE NAVY'S DEIS IS FATALLY FLAWED AND FAILS TO COMPLY WITH THE BASIC REQUIREMENTS OF NEPA** As set forth below, the Navy's DEIS does not meet the rigorous standards set forth in the National Environmental Policy Act. We urge the Navy to reissue its EIS and substantially alter the approach it has taken thus far. The Navy's scope of review must be expanded, its alternatives analysis broadened, its mitigation plan significantly improved, and its impact assessment revised to reflect the scientific evidence of mid frequency sonar's effects on marine life. These critical steps must be undertaken if the Navy's EIS is to comply with federal law. 1. Legal Framework: The National Environmental Policy Act The National Environmental Policy Act of 1969 ("NEPA") "declares a broad national commitment to protecting and promoting environmental quality." Robertson v. Methow Valley Citizens Council, 490 U.S. 332,348 (1989). NEPA establishes a national policy to "encourage productive and enjoyable harmony between man and his environment" and "promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man." 42 U.S.C. § 4321. In order to achieve its	As explained above, the Navy's statement of the purpose and need for the proposed action is detailed and specific, the scope of the proposed action is described in exhaustive detail after careful assessment of training and RDT&E requirements, and the development of alternatives has been conducted according to the highest standards and requirements of NEPA. The EIS/OEIS is the product of extensive analysis applying best available science, including methodologies for analyzing impacts of MFA sonar on marine mammals that were developed in close consultation with NMFS. The Navy has developed, refined and adopted mitigation measures to address environmental impacts in every affected resource area, and has identified any unavoidable impacts of the proposed action. The Navy has further conducted an appropriate analysis of cumulative effects of its proposed action. The EIS/OEIS takes a "hard look" at potential environmental consequences of the proposed action and alternatives, and provides sufficient information for careful agency decision-making.

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		broad goals, NEPA mandates that "to the fullest extent possible" the "policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with [it]." 42 U.S.C. § 4332. Central to NEPA is its requirement that, before any federal action that "may significantly degrade some human environmental factor" can be undertaken, agencies must prepare an EIS. Steamboaters v. F.E.R.C, 759 F.2d 1382, 1392 (9th Cir. 1985) (emphasis in original). The requirement to prepare an EIS "serves NEPA's action forcing purpose in two important respects." Robertson, 490 U.S. at 349. First, "the agency, in reaching its decision, will have available, and will carefully consider, detailed information concerning significant environmental impacts[,]" and second, "the relevant information will be made available to the larger audience that may also play a role in both the decisionmaking process and the implementation of that decision." Id. (emphasis added). As the Supreme Court explained: "NEPA's instruction that all federal agencies comply with the impact statement requirement... 'to the fullest extent possible' [cit. omit.] is neither accidental nor hyperbolic. Rather the phrase is a deliberate command that the duty NEPA imposes upon the agencies to consider environmental factors not be shunted aside in the bureaucratic shuffle." Flint Ridge Development Co. v. Scenic Rivers Ass'n, 426 U.S. 776,787 (1976). The fundamental purpose of an EIS is to force the decision-maker to take a "hard look" at a particular action - at the agency's need for it, at the environmental consequences it will have, and at more environmentally benign alternatives that may substitute for it before the decision to proceed is made. 40 C.F.R. §§ 1500.1(b), 1502.1; Baltimore Gas & Electric v. NRDC, 462 U.S. 87, 97 (1983). This "hard look" requires agencies to obtain high quality information and accurate scientific analysis. 40 C.F.R. § 1500.1(b). "General statements about possible effects and some risk do not constitute a hard look absent a justification regarding why more definitive information could not be provided." Klamath-Siskiyou Wilderness Center v. Bureau of Land Management, 387 F.3d 989, 994 (9th Cir. 2004) (quoting Neighbors of Cuddy Mountain v. United States Forest Service, 137 F.3d 1372, 1380 (9th Cir. 1998». The law is clear that the EIS must be a pre-decisional, objective, rigorous, and neutral	

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		document, not a work of advocacy to justify an outcome that has been foreordained. In nearly every respect, the Navy's DEIS fails to meet the high standards of rigor and objectivity required under NEPA. The Navy has failed to conduct the "hard look" necessary to thoroughly examine the many environmental consequences of its proposed action.	
NRDC - 26	NRDC - Appendix A - 2	**II. The Navy Fails to Properly Analyze Impacts on Marine Mammals** The Navy's DEIS does not properly analyze the environmental impacts. Its analysis also substantially understates the potential effects of sonar on marine wildlife. For instance, the Navy fails to acknowledge risks posed to a wide range of marine species including the highly endangered North Pacific right whale - from its training activities. The DEIS concludes that only one Dall' s porpoise would suffer serious injury or die during the many hours of proposed sonar training. DEIS at 3.8-148. The Navy reaches this conclusion by excluding relevant information adverse to its interests, using approaches and methods that are unacceptable to the scientific community and ignoring entire categories of impacts. As discussed in detail in Appendix C and the attached critique by Dr. David Bain, the Navy's assessment of acoustic impacts is also highly problematic.	The Draft EIS/OEIS used the most current, relevant scientific information, in many cases in coordination with the National Marine Fisheries Service, to develop the analysis on sonar training and potential impacts to marine mammals. The analysis is very thorough and complete in this regard. The Navy feels the estimated “takes” (found in Tables 3.8-14 and 3.8-17 of the EIS/OEIS) are overestimates for numerous reasons, three of which are described below: 1) Where a range of density estimates existed, or where densities were seasonal, the modeling considered only the greatest density. This assumption leads to more animals within a sonar’s range, and therefore more takes. 2) The modeling estimates do not consider the positive impacts of the Navy’s mitigation measures. In reality, many of the estimated takes (primarily PTS and TTS) would be eliminated due to power down procedures in place as a marine mammal approaches a sonar source. 3) All surface ship sonars are modeled as the more powerful SQS-53C, when in reality, 60% of all surface ship sonar hours proposed are significantly less powerful (225 dB compared to 235 dB of the SQS-53C).
NRDC - 27	NRDC - Appendix A - 3	**A. Acoustic Impacts on Marine Mammals** NEPA requires agencies to ensure the "professional integrity, including scientific integrity," of the discussions and analyses that appear in EISs. 40 C.F.R. § 1502.24. To that end, they must make every attempt to obtain and disclose data necessary to their analysis. See 40 C.F.R. § 1502.22(a). Agencies are further required to identify their methodologies, indicate when necessary information is incomplete or unavailable, acknowledge scientific disagreement and data gaps, and evaluate indeterminate adverse impacts based upon approaches or methods "generally accepted in the scientific community." 40 C.F.R. §§ 1502.22(2), (4), 1502.24. Such requirements become acutely important in cases where, as here, so much about a program's impacts depend on newly emerging science.	The marine mammal acoustical analysis is based on the use of the best available and applicable science (see Section 3.8 and Appendix D) as it applies to mid-frequency and high-frequency sources used during training in the GOA TMAA. The Navy has been thorough in its use of all relevant information. The analysis is in full compliance with NEPA.

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		In this case, the Navy's assessment of impacts is consistently undermined by its failure to meet these fundamental responsibilities of scientific integrity, methodology, investigation, and disclosure. As set forth in greater detail in Appendix C and the attached critique by Dr. Bain, the DEIS disregards a great deal of relevant information adverse to the Navy's interests, uses approaches and methods that would not be acceptable to the scientific community, and ignores whole categories of impacts. In short, it leaves the public with an analysis of harm-behavioral, auditory, and physiological-that is at odds with established scientific authority and practice. The Navy must revise its acoustic impacts analysis, including its thresholds and risk function, to comply with NEPA.	
NRDC - 28	NRDC - Appendix A - 4	**B. Other Impacts on Marine Mammals** The activities proposed for the GOA may have impacts that are not limited to the effects of ocean noise. Unfortunately, the Navy's analysis of these other impacts is cursory and inadequate. First, the Navy fails to adequately assess the impact of stress on marine mammals, a serious problem for animals exposed even to moderate levels of sound for extended periods. [17] DEIS at 3.8-72 to 73. As the Navy has previously observed, stress from ocean noise-alone or in combination with other Stressors, such as biotoxins-may weaken a cetacean's immune system, making it "more vulnerable to parasites and diseases that normally would not be fatal."[18] Moreover, according to studies on terrestrial mammals, chronic noise can interfere with brain development, increase the risk of myocardial infarctions, depress reproductive rates, and cause malformations and other defects in young-all at moderate levels of exposure. [19] Because physiological stress responses are highly conservative across species, it is reasonable to assume that marine mammals would be subject to the same effects. Yet despite the potential for stress in marine mammals and the significant consequences that can flow from it, the Navy unjustifiably assumes that such effects would be minimal. _____ [17] See National Research Council, Ocean Noise and Marine Mammals. [18] Navy, Hawaii Range Complex Draft Environmental Impact Statement! Overseas Environmental Impact Statement at 5-19 to 5-	First, exposure to mid or high frequency active sonar will not result in a chronic noise in the GOA TMAA. Sonar pings are brief and intermittent with animals exposed at most approximately 2 times a minute for several minutes if undetected. Given the manner in which sonar is typically used, and the movement of the participants, it is extremely unlikely that individual animals would be exposed to sonar for extended periods. Studies of odontocetes chased during purse seining of tuna showed stress effects when pursued for long periods (30-40 minutes) but most of those animals recovered (Edwards 2007 International Journal of Comparative Psychology, 20: 217-227). Since the impact from noise exposure and the Navy training events in general should be transitory given the movement of the participants, any stress responses should be short in duration and have less than significant consequences.

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		20 (2007). Additional evidence relevant to the problem of stress in marine mammals is summarized in AJ. Wright, N. Aguilar Soto, AL. Baldwin, M. Bateson, C.M. Beale, C.Clark, T. Deak, E.F. Edwards, A Fernandez, A Godinho, L. Hatch, A Kakuschke, D. Lusseau, D. Martineau, L.M. Romero, L. Weilgart, B. Wintle, G. Notarbartolo di Sciara, and V. Martin, Do marine mammals experience stress related to anthropogenic noise?, 20 International Journal of Comparative Psychology, 274-316 (2007); see also T.A Romano, MJ. Keogh, C. Kelly, P. Feng, L. Berk, C.E. Schlundt, D.A Carder, and U. Finneran, Anthropogenic Sound and Marine Mammal Health: Measures of the Nervous and Immune Systems Before and After Intense Sound Exposure, 61 Canadian Journal of Fisheries and Aquatic Sciences 1124, 1130-31 (2004). [19] See, e.g.E.F. Chang and M.M. Merzenich, Environmental Noise Retards Auditory Cortical Development, 300 Science 498 (2003) (rats); S.N. Willich, K. Wegscheider, M. Stallmann, and T. Keil, Noise Burden and the Risk of Myocardial Infarction, European Heart Journal (2005) (Nov. 24, 2005) (humans); F.H. Harrington and AM. Veitch, Calving Success of Woodland Caribou Exposed to LowLevel Jet Fighter Overflights, 45 Arctic vol. 213 (1992) (caribou).	
NRDC - 29	NRDC - Appendix A - 5	Second, the Navy fails to consider the risk of ship strikes with large cetaceans, as exacerbated by the use of active acoustics. DEIS at 3.8.3 and 3.8.4 generally. For example, right whales have been shown to engage in dramatic surfacing behavior, increasing their vulnerability to ship strikes, on exposure to mid-frequency alarms above 133 dB re 1 ~a (SPL)-a level of sound that can occur many tens of miles away from the sonar systems slated for the GOA.[20] DEIS 3.8-96. [20] Nowacek et al., North Atlantic Right Whales, 271 Proceedings of the Royal Society of London, Part B: Biological Sciences at 227. The North Pacific right whale is an endangered species closely related to the studied North Atlantic right whale.	Ship strikes were discussed in the Draft EIS/OEIS, Section 3.8.7.6. Results of the research by Nowacek et al (2004) where right whales reacted to an "alert stimuli", used a sound source that has almost no correlation to MFA sonar (Section 3.8.3.4). The results of that study were, however, used to develop the risk function from which the quantification of predicted exposures was derived.
NRDC - 30	NRDC - Appendix A - 6	A conservative approach would assume that other large whales (which, as the DEIS repeatedly notes, are already highly susceptible to vessel collisions) are subject to the same hazard. For instance, fin whales also occur within the GOA and appear to be particularly vulnerable to ship strikes.[21] Indeed, in a recent 16-year survey of ship strikes in Washington State waters, fin whales "had the highest incidence of ante-mortem ship strike" of the seven species of large whales examined.[22] Even the DEIS finds that "[w]orldwide historical records indicate fin whales were the	The Draft EIS/OEIS does in fact discuss the potential for mortality and injury to whales (including fin whales) in terms of the likelihood of striking them. The EIS/OEIS describes the factors that may help to avoid collisions with all marine mammals in Section 3.8.8. The document cited in the comment, Douglas 2008, documents no Navy collisions and also reports that Navy has tighter and more restrictive procedures for both watchstander and reporting that typical vessel traffic in the area.

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		most likely species to be struck by vessels." DEIS at 3.8-16. But the DEIS then dismisses the effects of vessel strikes on fin whales based solely on an "unpublished preliminary summary of opportunistically collected reports." DEIS at 3.8-16. The DEIS fails to discuss even the potential for mortality or injury to fin whales from ship strikes. NEPA's hard look requires the Navy to undertake a far more detailed examination of this potentially significant source of mortality for fin whales under even the No Action Alternative, as well as from the increase in vessel traffic that would occur under Alternatives 1 and 2. [21] See http://www.cascadiaresearch.org/WestportBm20090113.htm [22] Annie B. Douglas, Incidence of ship strikes of large whales in Washington State, Journal of the Marine Biological Association of the United Kingdom, 2008, 88(6), 1121-1132, available at http://www.cascadiaresearch.orglreportslDouglaso/o20et%20al%20 2008Incidence% 20of%20ship%20strikes%200f%20large%20whales.pdf.	
NRDC - 31	NRDC - Appendix A - 7	Third, in the course of its training activities, the Navy would release a host of toxic chemicals, hazardous materials and waste into the marine environment that could pose a threat to marine mammals over the life of the range. Under its preferred alternative, the Navy also plans to abandon at least 352,000 pounds of spent material (both hazardous and non hazardous) in GOA waters every year, including 360 bombs, 66 missiles, 644 targets and pyrotechnics, 26,376 gunshells, 11,400 small caliber rounds, and 1,587 sonobuoys. Over 10,300 pounds of this expended material is hazardous. DEIS at ES15 to 28; 3.2-28 to 34; 3.6-34. Nonetheless, the DEIS fails to adequately consider the cumulative impacts of these toxins on marine mammals from past, current, and proposed training exercises. Careful study is needed into the way toxins might disperse and circulate within the area and how they may affect marine wildlife.	Past expenditures are part of the baseline environmental conditions described in Section 3.2.1.1 of the EIS/OEIS. The EIS/OEIS, Section 3.2.2, evaluated the proposed future expenditure and environmental result of a variety of training materials. Both qualitative and quantitative assessments of these expenditures conclude that their effects on water quality and bottom sediments, and on the biota that inhabit these environments, would be negligible. A cumulative impact is the sum of the Proposed Action's effects and the effects of other projects. Thus, while the combined ocean discharges of wastewater treatment plants, urban runoff, marine vessels, and other sources may result in unhealthful concentrations of marine pollutants, the Navy's expended training materials would not contribute to that impact because expended training materials contain hazardous constituents, such as residual explosives, not found in pollutants from other sources.
NRDC - 32	NRDC - Appendix A - 8	The Navy's assumption that expended materials and toxics would dissipate or become buried in sediment leads to a blithe conclusion that releases of hazardous material would have no adverse effects. Given the amount of both hazardous and nonhazardous materials, this discussion is inadequate under NEPA.	The EIS/OEIS document presents a thorough description and analysis in Section 3.2 of amounts and types of specific training materials as well as chemical composition and breakdown processes of expended materials. The total amounts of expended and hazardous materials for each alternative are summarized in Tables 3.2-10, 3.2-14, and 3.2-19.

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			Based on the best available science, no individual expended materials would result in water or sediment toxicity surrounding the expended item. No water or sediment toxicity would occur, so no adverse effects on marine organisms would be expected. In addition, as identified in Section 3.2.1.1, a recent study of similar Canadian military operations in the Strait of Georgia found that few biological impacts resulted from ordnance and other materials expended during its operations (Canadian Forces Maritime Experimental and Test Ranges [CFMETR] 2005). The Navy has taken a hard look through its analysis and has considered the best available in supporting its conclusions, which would be considered adequate under NEPA. Text on PCBs from SINKEX vessels and leaching rate of copper thiocyanate from sonobuoys have been added to Sections 3.2.2.6 and 3.2.1.1, respectively.
NRDC - 33	NRDC - Appendix A - 9	Fourth, the Navy does not adequately analyze the potential for and impact of oil spills. As evidenced by the 1989 Exxon Valdez oil spill, there is a significant existing risk of an oil spill in the GOA. This risk is exacerbated by increasing the tempo and intensity of Navy training, which will involve more vessels, more transits, and longer missions throughout the TMAA.[23] In light of this history and the extraordinarily valuable and sensitive natural resources that occur in the GOA, the Navy must evaluate its spill response plan and station salvage equipment accordingly. [23] We note that the Navy should include in its analysis and disclose to the public a chart that shows how its operating areas overlap shipping lanes, recommended routes, and Areas to Be Avoided as an indication of the potential for conflict with other vessels.	The analysis presented in the EIS/OEIS is limited to the activities and reasonable outcomes of such activities. As accidents involving other vessels and oil spills are not reasonably foreseeable, nor anticipated, the impact of such occurrences are not addressed or analyzed. Preventing oil spills is one of the Navy's top priorities. The Navy conducts all training exercises in the TMAA under guidance provided in OPNAVINST 5090.1C, Environmental Readiness Program Manual. All Navy vessels have Navy Shipboard Oil Spill Contingency Plans (SOSCPs), which identifies shipboard procedures for preventing, reporting, and responding to oil spills originating on the ship. Effective oil spill planning and response is an important issue for the Navy, for regulatory agencies, and for the public. Commanding officers make every effort to minimize oil spill risks across all Navy operations through application of aggressive spill prevention measures. All ships strive to continuously reduce oil spills through proper preparation, rigid adherence to published procedures, and application of the full measure of command attention to any operation involving movement of oil and oily waste.
NRDC - 34	NRDC - Appendix A - 10	Finally, the Navy's analysis cannot be limited only to direct effects, i.e., effects that occur at the same time and place as the training exercises that would be authorized. 40 C.F.R. § 1508.8(a). It must also take into account the activity's indirect effects, which, though reasonably foreseeable (as the DEIS acknowledges), may occur later in time or are	The potential for indirect effects on marine mammals has been considered in Section 3.8 in developing the methodology for assessing acoustic impacts, and it is thereby acknowledged that direct acoustic harassment of an individual can lead to other, indirect effects. The likely existence of such effects is accounted for in the estimation of "take" and they are

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		further removed. 40 C.F.R. § 1508.8(b). This requirement is particularly critical in the present case given the potential for sonar exercises to cause significant long-term impacts not clearly observable in the short or immediate term (a serious problem, as the National Research Council has observed).[24] Thus, for example, the Navy must not only evaluate the potential for mother-calf separation but also the potential for indirect effects-on survivability-that might arise from that transient change. 40 C.F.R. § 1502.16(b). Without further consideration of these impacts, and mitigation and alternatives developed to address those impacts, the DEIS does not pass NEPA muster. [24] "Even transient behavioral changes have the potential to separate mother-offspring pairs and lead to death of the young, although it has been difficult to confirm the death of the young." National Research Council, Ocean Noise and Marine Mammals at 96.	otherwise not predictable or amenable to quantification. In addition, as described in this analysis, the training activities being analyzed have been performed for decades in the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The Navy's analysis indicates and this history indicates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
NRDC - 35	NRDC - Appendix A - 11	**C. Other Impacts on Wildlife** The same concerns that apply to marine mammals - such as injury or death from mid frequency active sonar, collisions with ships, bioaccumulation of toxins, and stress apply to sea turtles, birds and other biota as well. The Navy must adequately evaluate impacts and propose mitigation for each category of harm. 40 C.F.R. §§ 1502.14, 1502.16. The effects of mid-frequency active sonar on sea turtles are glossed over on the grounds that their best hearing range appears to occur below 1 kHz. DEIS at 3.7-5 to 6. But having their best acoustic sensitivity in this range does not mean that sea turtles are oblivious to noise at higher frequencies. As the Navy admits, juvenile and adult loggerheads hear sounds all the way up to 1 kHz, suggesting that they continue to detect sounds at higher levels, including potentially the lower end of the intense mid-frequency sources intended for the range. Furthermore, they have been shown to engage in startle and escape behavior - behavior that may involve diving and surfacing - and to experience heightened stress in response to vessel noise. Thus, a more rigorous analysis of potential impacts of mid-frequency sonar is necessary.	The Navy has analyzed potential impacts from ship strikes, bioaccumulation of toxins, and stress on multiple species within the marine resources sections; Sections 3.5-3.9. The Navy has included mitigation measures for each resource within each respective section and within Chapter 5; mitigation measures. Regarding sea turtles, while there are some sea turtles that may be able to hear sounds at 1 kHz, there is a very large difference between sounds at 1 kHz and sounds at 3.5 kHz than would be evident in simply looking at the difference between the numbers (a delta of -2.5). As presented in Section 3.7 regarding leatherback turtles in the TMAA, current best available science and all available indications are that they are not likely able to hear mid-frequency sonar. Regarding bioaccumulation, please see response to CDFU – 9.
NRDC - 36	NRDC - Appendix A - 12	Nor is the Navy's reasoning with regard to seabirds any more sound. Although the Navy acknowledges that "little is known about the general hearing or underwater hearing capabilities of birds" (DEIS at 3.9-7), it then inexplicably	Within the GOA, there are only non-threatened/endangered seabird species found that would potentially be affected by sonar. The short-tailed albatross is a surface feeding species that does not dive underwater for prey. Even when plunging

ID	Organization	Public Comment (Written)	Navy Response
		concludes that because there is "no evidence that birds utilize sound underwater to forage or locate prey... [any] effects were unlikely". DEIS at 3.9-8. Such reasoning does not bear up to any serious scrutiny. Seabirds occur in the GOA, dive underwater (in some cases to depths of hundreds of feet), and are sensitive to same frequencies used by the Navy's acoustic sources. They must receive further analysis in the DEIS, both for the direct impacts they may suffer on exposure to the Navy's acoustic sources and for the impacts they may incur indirectly through depletion of prey species and hard bottom habitat. 40 C.F.R. § 1502. 16(a), (b). Without further consideration of these species, the Navy's review is incomplete.	short distances, there is no evidence that the species use sound to locate prey or would be underwater long enough to be injured by sonar. Therefore, the likelihood that seabirds would be affected by sonar based on their foraging behavior is unlikely. For more information on the short-tailed albatross, see response to Greg Brown – 17. Other seabird populations that may dive would only be found near prey in shallower areas (including seamounts) or in areas of upwelling. Almost all areas where diving seabirds would be found would be outside the TMAA. In a small percentage, non-threatened/endangered diving individuals would be found near seamounts within the TMAA but any injury would be rare and only affect individuals diving at the moment of a sonar ping and would certainly not affect populations of any seabirds.
NRDC - 37	NRDC - Appendix A - 13	**III. The Navy Failed to Analyze the Impacts on Fish and Fisheries** The GOA is a highly productive region for fish populations. It supports some of the most productive and commercially important fisheries in the United States (including salmon, halibut, crab, shrimp, pollock, Pacific cod, and mackerel fisheries). The TMAA supports six species of salmonoids - five of which are designated as "endangered" or "threatened" (Chinook, coho, chum, pink, and sockeye salmon and steelhead trout). The TMAA also supports hundreds of other species, including Pacific halibut, groundfish (walleye pollock, Pacific, sablefish, rockfishes, rex sole, Dover sole, arrowtooth flounder, etc.), dungeness crab, and scallops. In addition, 68 fish and invertebrate species with federally designated essential fish habitat occur in the TMAA. In its DEIS, the Navy fails to acknowledge the impacts of anthropogenic sound on fish, fisheries and essential fish habitat. On the one hand, the Navy claims that there is a "dearth of empirical information on the effects of exposure to sound, [especially] sonar...." DEIS at 3.6-43. Yet on the other hand it ignores a wide-range of scientific studies on the impacts of noise on fish, claiming the studies "would be very difficult to extrapolate" and "focused on behavior of individuals of a few species and it is unlikely their responses are representative of the wide diversity of other marine fish species." DEIS at 3.6-27, 43. The Navy is therefore able to conclude - without basis –that noise from its training activities - including both mid-frequency active sonar and	Assessment of sounds was presented in the Draft EIS/OEIS for the various acoustic sources expected in the GOA TMAA as a result of training activities. The range of acoustic effects analyzed includes no effect, small behavioral effects, significant behavioral effects, temporary loss of hearing, and physical damage. Scientific studies concerning sounds relevant to Navy activities in the GOA TMAA were evaluated in the EIS/OEIS. See Section 3.6.1.4 for discussion on hearing ranges in fish and also Sections 3.6.2.3 through 3.6.2.5 for discussion of effects of proposed actions on fishes (explosive sounds, sonar usage, etc.) This information is based on the best available science and research being conducted by the Navy, which includes some of the foremost researchers and experts on hearing in fishes. For additional information, please see responses to Greg Brown – 11 through 15.

ID	Organization	Public Comment (Written)	Navy Response
		underwater detonations - would have no significant impact on fish, fisheries and essential fish habitat. The Navy's conclusion not only contradicts the available scientific literature on noise but also ignores the valid concerns of fishermen. For example, fisherman concerned with declining catch rates wrote letters opposing the Navy's proposal to build an Undersea Warfare Training Range off the coast of North Carolina in 2005. Those fishermen reported sharp declines in catch rates in the vicinity of Navy exercises.	
NRDC - 38	NRDC - Appendix A - 14	**A. Decline in Catch Rates** For years, fisheries in various parts of the world have complained about declines in their catch after intense acoustic activities (including naval exercises) moved into the area, suggesting that noise is seriously altering the behavior of some commercial species.[25] A group of Norwegian scientists attempted to document these declines in a Barents Sea fishery and found that catch rates of haddock and cod (the latter known for its particular sensitivity to low-frequency sound) plummeted in the vicinity of an airgun survey across a 1600-square-mile area. In another experiment, catch rates of rockfish were similarly shown to decline.[26] Drops in catch rates in these experiments range from 40 to 80 percent.[27] A variety of other species, herring, zebrafish, pink snapper, and juvenile Atlantic salmon, have been observed to react to various noise sources with acute alarm.[28] In their comments on the Navy's Draft Environmental Impact Statement for the proposed Undersea Warfare Training Range off the coast of North Carolina, several fishermen and groups of fishermen independently reported witnessing sharp declines in catch rates of various species when in the vicinity of Navy exercises. [29] These reports are also indicative of behavioral changes -such as a spatial redistribution of fish within the water column - that could similarly affect the fisheries in the GOA. [25] See "'Noisy' Royal Navy Sonar Blamed for Falling Catches," Western Morning News, Apr. 22, 2002 (sonar off the u.K.); Percy J. Hayne, President of Gulf Nova Scotia Fleet Planning Board, "Coexistence of the Fishery & Petroleum Industries," www.elements.nb.ca/themelfuels/percy/hayne.htm (accessed May 15,2005) (airguns off Cape Breton); R.D. McCauley, J. Fewtrell, AJ.	Acoustic effects other than hearing loss were analyzed in the EIS/OEIS. The range of acoustic effects analyzed includes no effects, small behavioral effects, significant behavioral effects, temporary loss of hearing, and physical damage. Scientific studies concerning sounds relevant to Navy activities in the GOA TMAA were evaluated in the EIS/OEIS. The Draft EIS/OEIS included new findings by Popper et al. (2007) who exposed rainbow trout, a fish sensitive to low frequencies, to high-intensity low-frequency sonar (215 dB re 1 µPa2 170-320 Hz) with receive level for two experimental groups estimated at 193 dB for 324 or 648 seconds. Fish exhibited a slight behavioral reaction, and one group exhibited a 20-dB auditory threshold shift at one frequency. No direct mortality, morphological changes, or physical trauma was noted as a result of these exposures. While low-frequency sonar is not included in the Proposed Action, these results of low-frequency sonar effects on low-frequency sensitive rainbow trout are encouraging in that similar results may be found with mid-frequency active sonar use when applied to mid-frequency sensitive fish. The effects of airguns (used in seismic surveys) on fish are undoubtedly more extreme than those of MFA sonar because of the intensity and broad bandwidth of the airgun sound source.

ID	Organization	Public Comment (Written)	Navy Response
		Duncan, C. Jenner, M.-N. Jenner, J.D. Penrose, R.I.T. Prince, A Adhitya, J. Murdoch, and K. McCabe, Marine Seismic Surveys: Analysis and Propagation of Air-Gun Signals, and Effects of Air-Gun Exposure on Humpback Whales, Sea Turtles. Fishes, and Squid 185 (2000) (airguns in general). [26] A Engas, S. L~kkeborg, E. Ona, and AV. Soldal, Effects of Seismic Shooting on Local Abundance and Catch Rates of Cod (Gadus morhua) and Haddock <Melanogrammus aeglefinusl, 53 Canadian Journal of Fisheries and Aquatic Sciences 2238-49 (1996); J.R. Skalski, W.H. Pearson, and C.I. Malme, Effects of Sound from a Geophysical Survey Device on Cateh-Per-Unit-Effort in a Hookand- Line Fishery for Rockfish (Sebastes spp.}, 49 Canadian Journal of Fisheries and Aquatic Sciences 1357-65 (l992). See also S. L9lkkeborg and AV. Soldal, The Influence of Seismic Exploration with Airguns on Cod (Gadus morhua) Behaviour and Catch Rates, 196 ICES Marine Science Symposium 6267 (1 993). [27] Id. [28] See J.H.S. Blaxter and R.S. Batty, The Development of Startle Responses in Herring Larvae, 65 Journal of the Marine Biological Association of the u.K. 737-50 (1985); F.R. Knudsen, P.S. Enger, and O. Sand, Awareness Reactions and Avoidance Responses to Sound in Juvenile Atlantic Salmon, Salmo salar L., 40 Journal of Fish Biology 523-34 {I 992); McCauley et al., Marine Seismic Surveys at 126-61. [29] See comments compiled by the Navy and posted on the Undersea Warfare Training Range EIS site, available at http://www.projects.earthtech.comlUSWTR (e.g., comments of S. Draughon, S. Fromer, L. and F. Gromadzki, D. Pendergrast, and North Carolina Watermen United).	
NRDC - 39	NRDC - Appendix A - 15	**B. Permanent Injury and Mortality** The Navy's conclusion that underwater noise will result in only "minimal harm" to fish ignores the scientific literature. A number of studies, including one on non-impulsive noise, show that intense sound can kill eggs, larvae, and fry outright or retard their growth in ways that may hinder their survival later.[30] Significant mortality for fish eggs has been shown to occur at distances of 5 meters from an airgun source; mortality rates approaching 50 percent affected yolksac larvae at distances of 2 to 3 meters.[31] With respect to mid-frequency sonar, the Navy itself has noted that "some sonar levels have been shown [in Norwegian studies] to be powerful enough to cause injury to particular size classes of juvenile herring from the water's surface to the seafloor." [32] Also, larvae in at least some species are known to use sound in selecting and orienting toward settlement sites.[33]	Please see response to AMCC – 13.

ID	Organization	Public Comment (Written)	Navy Response
		Acoustic disruption at that stage of development could have significant consequences.[34] Although the Navy acknowledges that eggs and larvae may be more susceptible to sound, it caveats that acknowledgement with the excuse that "more well-controlled studies are needed." DEIS at 3.6-43. However, federal law does not allow the Navy to ignore the valid scientific studies that have already been conducted simply because they are contrary to its interest. As the Navy is aware after recently completing consultation with both NMFS (for salmon) and the U.S. Fish and Wildlife Service (for bull trout) over its Explosive Ordinance Disposal ("EOD") training exercises in Puget Sound, underwater explosions are responsible for high direct mortality to fish species present in the area. Indeed, the underwater detonation of just five pounds of plastic explosives has been observed to kill over 5,000 fish with swim bladders, with more accurate estimates ranging as high as 20,000 fish. There are a variety of live-fire training exercises, some of which involve underwater explosions of torpedoes and other ordnance that will take place in the GOA. Given the variety of fish and fisheries inhabiting these waters, the Navy's failure to analyze these effects in significant detail is stunning. [30] See,e.g., C. Booman, J. Dalen, H. Leivestad, A. Levsen, T. van der Meeren, and K. Toklum, Effecter av luftkanonskyting oa egg, larver og yngel <Effects from Airgun Shooting on Eggs. Larvae, and Fry>. 3 Fisken og Havet 1-83 (1996) (Norwegian with English summary); 1. Dalen and G.M. Knutsen, Scaring Effects on Fish and Harmful Effects on Eggs. Larvae and Fry by Offshore Seismic Explorations, in H.M. Merklinger, Progress in Underwater Acoustics 93-102 (1987); A. Banner and M. Hyatt, Effects of Noise on Eggs and Larvae of Two Estuarine Fishes, 1 Transactions of the American Fisheries Society 134-36 (1973); L.P. Kostyuchenko, Effect of Elastic Waves Generated in Marine Seismic Prospecting on Fish Eggs on the Black Sea, 9 Hydrobiology Journal 45-48 (1973). [31] Booman et al., Effecter av luftkanonskyting pa egg, larver og yngel at 1-83. [32] Navy, Draft Environmental Impact Statement! Overseas Environmental Impact Statement for the Southern California Range Complex 3.7-66 to 3.7-67 (2008). In the GOA, the Navy would operate sonar at higher levels than those used in the Norwegian studies.	

ID	Organization	Public Comment (Written)	Navy Response
		[33] S.D. Simpson, M. Meekan, J. Montgomery, R. McCauley, R., and A. Jeffs, Homeward Sound, 308 Science 221 (2005). [34] Popper, Effects of Anthropogenic Sounds at 27.	
NRDC - 40	NRDC - Appendix A - 16	**C. Hearing Loss** One series of recent studies showed that passing airguns can severely damage the hair cells of fish (the organs at the root of audition) either by literally ripping them from their base in the ear or by causing them to "explode."[35] Fish, unlike mammals, are thought to regenerate hair cells, but the pink snapper in these studies did not appear to recover within approximately two months after exposure, leading researchers to conclude that the damage was permanent.[36] It is not clear which elements of the sound wave contributed to the injury, or whether repetitive exposures at low amplitudes or a few exposures at higher pressures, or both, were responsible.[37] As with marine mammals, sound has also been shown to induce temporary hearing loss in fish. Even at fairly moderate levels, noise from outboard motor engines is capable of temporarily deafening some species of fish, and other sounds have been shown to affect the short term hearing of a number of other species, including sunfish and tilapia.[38] For any fish that is dependent on sound for predator avoidance and other key functions, even a temporary loss of hearing (let alone the virtually ~permanent damage seen in snapper) will substantially diminish its chance of survival.[39] [35] R. McCauley, J. FewtrelJ, and AN. Popper, High Intensity Anthropogenic Sound Damages Fish Ears, 113 Journal of the Acoustical Society of America 640 (2003). [36] Id. at 641 (some fish in the experimental group sacrificed and examined 58 days after exposure). [37] Id. [38] A.R. Scholik and H.Y. Yan, Effects of Boat Engine Noise on the Auditory Sensitivity of the Fathead Minnow. Pimephales promelas, 63 Environmental Biology of Fishes 203-09 (2002); AR. Scholik and H.Y. Yan, The Effects of Noise on the Auditory Sensitivity of the Bluegill Sunfish, Lepomis macrochirus, 133 Comparative Biochemisty and Physiology Part A at 43-52 (2002); M.E. Smith, AS. Kane, & AN. Popper, Noise-Induced Stress Response and Hearing Loss in Goldfish (Carassius auratus}, 207 Journal of Experimental Biology 427-35 (2003); Popper, Effects of Anthropogenic Sounds at 28. [39] See Popper, Effects of Anthropogenic Sounds at 29; McCauley et al., High Intensity Anthropogenic Sound Damages Fish Ears, at	The Navy has provided the best available science in reviewing impacts to fish from mid-frequency sonar. Page 3.6-41 and discussion therein explains various studies thus far into the impact of sonar on varying fish species. Since release of the Draft EIS/OEIS, a new study has been published by *Doksaeter, et. al* that is also explained in the FEIS in this same section. While the effects of sound on all species of fish have not been studied, leaving much unknown, there are reasonable extrapolations that can be made based on the general anatomy of fish and from the representative species that have been studied. NEPA allows us to explore something such as this with scientific uncertainty in an EIS/OEIS setting. Based on those studies and as detailed in Section 3.6, it is unlikely that sonar will adversely affect most fish given most fish cannot hear in the frequency range of the mid and high frequency sonar Navy is proposing to use. In addition, Navy has been conducting these same training activities in locations such as Southern California and the East Coast for many decades and both of which support healthy and diverse fisheries. For more information, please see response to NRDC – 39.

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NRDC - 41	NRDC - Appendix A - 17	**D. Breeding Behavior** NMFS has observed that the use of mid-frequency sonar could affect the breeding behavior of certain species, causing them, for example, to cease their spawning choruses, much as certain echolocation signals do.[40] The repetitive use of sonar and other active acoustics could thus have significant adverse behavioral effects on some species of fish and those who depend on them. [40] Letter from Miles M. Croom, NMFS Southeast Regional Office, to Keith Jenkins, Navy (Jan. 31,2006); see also J.J. Luczkovich, "Potential Impacts of the U.S. Navy's Proposed Undersea Warfare Training Range on Fishes" (2006) (presentation to Navy).	The EIS/OEIS included new findings by Popper et al (2007) who exposed rainbow trout, a fish sensitive to low frequencies, to high-intensity low-frequency sonar (215 dB re 1 µPa2 170-320 Hz) with receive level for two experimental groups estimated at 193 dB for 324 or 648 seconds. Fish exhibited a slight behavioral reaction, and one group exhibited a 20-dB auditory threshold shift at one frequency. No direct mortality, morphological changes, or physical trauma was noted as a result of these exposures. While low-frequency sonar is not included in the Proposed Action, these results of low-frequency sonar effects on low-frequency sensitive rainbow trout suggests that similar results may be found with mid-frequency active sonar use when applied to mid-frequency sensitive fish. The assessment for the proposed mid-frequency sound sources (at or above the 3.5 kHz center frequency) suggests that with few exceptions, fish cannot hear sounds above about 3 kHz (Popper 2003, Hastings and Popper 2005). Thus, it is expected that most fish species would not be able to hear the mid-frequency sonar proposed for use in the TMAA. If responses to mid-frequency sonar use do occur, behavioral responses would be brief, reversible, and not biologically significant. Sustained auditory damage is not expected. Sensitive life stages (juvenile fish, larvae and eggs) very close to the sonar source may experience injury or mortality, but below the level of loss of larval and juvenile fish from natural causes. The use of Navy mid-frequency sonar would not compromise the productivity of fish or adversely affect their habitat.
NRDC - 42	NRDC - Appendix A - 18	In sum, the Navy arbitrarily dismisses the potential for adverse impacts on fish. The Navy also capriciously dismisses the notion that fisheries in the area would suffer economic loss, even though - judging by the comments from North Carolina fishermen in 2005 - its training activities appear to have disrupted fishing in the past. Just like the training proposed in North Carolina, the available evidence here underscores the need for a more serious and informed analysis than the Navy currently provides. To comply with the requirements of NEPA, the Navy should rigorously analyze the potential for behavioral, auditory, and physiological impacts on fish, including the potential for population-level effects, using models of fish distribution and	The Navy has conducted a thorough and complete analysis considering fish species and habitat. The Navy has found through the analysis that the proposed actions would have no significant impacts to fish species and/or their habitat. Certain types of training activities would not take place in certain habitats, for example, SINKEXs can only occur in waters that meet depth and distance from shore requirements. Therefore, a SINKEX could not occur on a seamount that is not more than 6,000 feet under sea level.

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		population structure and conservatively estimating areas of impact from the available literature. 40 C.F.R. § 1502.22. The Navy must also meaningfully assess the economic consequences of reduced catch rates on commercial and recreational fisheries (as well as on marine mammal foraging) in the GOA. It should also consider avoiding essential fish habitat, spawning grounds and other areas of important habitat for fish species, especially hearing specialists. Notably, as with marine mammals, the Navy does not consider exclusion of important fish habitat or fisheries in the TMAA.	
NRDC - 43	NRDC - Appendix A - 19	**IV. The Navy's Proposed Mitigation Measures Fail to Protect Marine Wildlife** To comply with NEPA, an agency must discuss measures designed to mitigate its project's impact on the environment. See 40 C.F.R. § 1502.14(f). There is a large and growing set of options for the mitigation of noise impacts to marine mammals and other marine life, some of which have been imposed by foreign navies[41]-and by the Navy itself, in other contexts-to limit harm from high-intensity sonar exercises. Yet here the Navy does little more than set forth an abbreviated set of measures, dismissing effective measures out of hand. All of the mitigation that the Navy has proposed for sonar impacts boils down to the following: a very small safety zone around the sonar source, maintained primarily with visual monitoring by personnel with other responsibilities, with aid from shipboard passive monitoring when personnel are already using such technology. Under the proposed scheme, operators would power-down the system if a marine mammal is detected within 1,000 yards and shut-down the system if a marine mammal is detected within 200 yards. DEIS at 5-8 to 13. [41] See S.I. Dolman, C.R. Weir, and M. Jasny, Comparative Review of Marine Mammal Guidance Implemented during Naval Exercises, _Marine Pollution Bulletin _ (Dec. 12, 2008).	Each nation has its own training needs based on that nation's forces, capabilities and missions. For the U.S. Navy, the ability to conduct ASW around varying underwater topography is critically necessary in order to fight the growing submarine threat. The Navy, in cooperation with NMFS, has developed effective mitigation measures as described in the EIS/OEIS. As described in more detail to specific comments that follow, several measures were eliminated because they were determined to be infeasible, present a safety risk, provide no known or ambiguous protective benefits, or have an unacceptable impact on training fidelity.
NRDC - 44	NRDC - Appendix A - 20	This mitigation scheme disregards the best available science on the significant limits of visual monitoring. Visual detection rates for marine mammals generally approach only 5 percent. Moreover, the species perhaps most vulnerable to sonar-related injuries, beaked whales, are among the most difficult to detect because of their small size	The Navy's mitigation plan is more than just visual monitoring. Aerial monitoring and passive acoustic monitoring are used as well. The EIS/OEIS, Chapter 5.0, Mitigation Measures, presented the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. Navy does not

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		and diving behavior. It has been estimated that in anything stronger than a light breeze, only one in fifty beaked whales surfacing in the direct track line of a ship would be sighted; as the distance approaches 1 kilometer, that number drops to zero.[42] Right whales are also notoriously hard to detect, and the Navy plans to train next to critical habitat for the highly endangered North Pacific right whale. Right whales are uniquely vulnerable to ship strikes because they often hover on or near the surface of the water. Due to their dark coloration and lack of a dorsal fin, however, they are difficult to detect. The Navy's reliance on visual observation as the mainstay of its mitigation plan is therefore profoundly misplaced. [42] J. Barlow and R. Gisiner, Mitigating. Monitoring, and Assessing the Effects of Anthropogenic Noise on Beaked Whales, 7 Journal of Cetacean Research and Management 239-249 (2006).	expect that 100% of the animals present in the vicinity of training events will be detected and therefore, acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness. In addition, the probability of trackline detection is for visual observers during a survey. In general, there will be more ships, more observers present on Navy ships, and additional aerial assets all engaged in exercise events having the potential to detect marine mammals, than is present on a single, generally smaller (having a lower height of eye), survey ship.
NRDC - 45	NRDC - Appendix A - 21	Further, the Navy's assurances that it will consider when planning exercises, several conditions that contribute to marine mammal stranding events provides no reassurance. Among the conditions the Navy will "consider" include: (1) areas of 1,000 m depth near a shoreline where there is a rapid change in bathymetry; (2) multiple ships or submarines operating sonar; (3) chokepoints and embayments; and (4) the historical presence of strong surface ducting conditions. DEIS at 5-12 to 13. While we applaud the Navy for recognizing these conditions of concern, NEPA requires more. The Navy must impose concrete mitigation measures rather than rhetorical issues of concern. The Navy's ineffective mitigation measures are all the more remarkable given its adoption of more protective measures during previous training. For example, the Atlantic Fleet has repeatedly sited exercises beyond the continental shelf and Gulf Stream, relocated exercises out of important habitat and to avoid certain species, and used a technique called "simulated geography" to avoid canyons and near-shore areas on at least three of its major ranges. It has also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time.[43] In this light, the Navy's claims that it cannot implement more protective mitigation measures ring false. DEIS at 5-28 to 41. Although the Navy goes to some pain to describe "alternative mitigation	Examples cited for the Atlantic Fleet are not necessarily relevant in the GOA where the species and the environment differ. It is critical that Navy be able to conduct ASW training in a variety of environment and bathymetric conditions, including in the vicinity of canyons. The canyon allows a submarine to hide in an area that is shadowed by the canyon walls because the active transmission cannot reach the sub via the bottom bounce path. Therefore, it is critical to operate MFA sonar in areas of high bathymetric variability. The Navy, in conjunction with the NMFS, has considered numerous mitigation measures during the development of this EIS/OEIS (Chapter 5). The mitigation measures adopted were determined to be the most effective and scientifically supported measures.

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		measures considered but eliminated" -primarily for "training effectiveness" reasons-its previous adoption of the same measures belies its argument. Clearly the Navy has done more to mitigate the harmful effects of sonar in previous exercises than what it proposes for the GOA. It can, and must, do more to mitigate the harm on marine wildlife. [43] Final Comprehensive Overseas Environmental Assessment for Major Atlantic Fleet Training Exercises February 2006, Prepared for United States Fleet Forces Command in accordance with Chief of Naval Operations Instruction 5090.IB pursuant to Executive Order 12114; See also Atlantic Fleet Exercises Using Mid-Frequency Sonar Mitigation Chart.	
NRDC - 46	NRDC - Appendix A - 22	**A. Protection Zones** As discussed above, there is scientific consensus that geographic mitigation represents the most effective means currently available to reduce the impacts of mid-frequency sonar on marine mammals.[44] The Navy should obtain additional data on marine mammal density and distribution in the TMAA, which would serve as a basis for predictive habitat modeling. Based on that additional information, the Navy should consider adopting protection zones in the GOA where sonar activity will be banned. [44] Supra, note 4.	Please see response to K. McLaughlin – 6.
NRDC - 47	NRDC - Appendix A - 23	**B. Mitigation of Navy Debris and Expended Material** The DEIS fails to set forth any mitigation measures concerning the massive amount of discarded debris and expended materials associated with the increased training in the GOA. The Navy claims that ocean currents will rapidly disperse the expended materials and thus no mitigation is required. "In NEPA's demand that an agency prepare a detailed statement on 'any adverse environmental effects which cannot be avoided should the proposal be implemented,' is an understanding that the EIS will discuss the extent to which adverse effects can be avoided." Robertson, 490 U.S. at 352-53. The Navy's "all-or-nothing approach" is not a sufficient discussion of how the adverse impacts of expended material can be avoided. By failing to explore mitigation measures for expended materials, the Navy does not even attempt to avoid, minimize, rectify, reduce, or compensate for its dumping of debris - all of which are options included in the CEQ regulation's definition	Mitigation under NEPA is implicitly limited to those effects that are determined to be significant. Activities that are categorically excluded or that are addressed in an Environmental Assessment clearly have effects, albeit minor, non-significant effects; there is no requirement under NEPA that mitigation measures be identified for these effects. Similarly, non-significant effects described in an EIS/OEIS require no discussion of potential mitigation measures - the mitigation discussion necessarily focuses on those impacts determined to be significant. The EIS/OEIS analysis determined that the low-density deposition of mostly inert remnants of military training materials over vast areas of ocean bottom, where individual items would have little or no effect on their surroundings, was not a significant impact. Additionally, the Navy's training activities already incorporate substantial "mitigation" for the expenditure of training materials. Since World War II, the use of simulation technology, non-explosive training rounds, green training

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		of "mitigation." 40 C.F.R. § 1508.20.	rounds, and retrievable targets, along with the evolution of more-efficient training programs and the overall reduction in quantities of potentially hazardous materials in expendable training materials have substantially decreased both the quantities of expended materials and their effects on the environment. In keeping with its emphasis on environmental stewardship, the Navy will continue to seek appropriate opportunities to further refine its training activities and further reduce the environmental effects of expended training materials.
NRDC - 48	NRDC - Appendix A - 24	B. Other Mitigation Measures In addition to the specific protection zones set forth above, the Navy should adopt the following measures: 1) Seasonal avoidance of marine mammal feeding grounds, calving grounds, and migration corridors;	This mitigation measure was eliminated from further consideration as explained in Section 5.2.1.6 of the EIS/OEIS. (Avoiding habitats and complex/steep bathymetry, including seamounts, and employing seasonal restrictions).
NRDC - 49	NRDC - Appendix A - 25	2) Avoidance of or extra protections in other federal and state marine protected areas, including the Waketickeh Creek Marine Protected Area, Copalis Marine Protected Area, Quillayute Needles Marine Protected Area, and other Marine Protected Areas in the areas considered.	Please note that the areas mentioned in the comment are located in the Hood Canal and within the Olympic Coast National Marine Sanctuary in the State of Washington, not in Alaska. Additionally, there are no MPAs within the TMAA. Furthermore, this mitigation measure was eliminated from further consideration as explained in Section 5.2.1.6 of the EIS/OEIS. (Limiting the active sonar event locations).
NRDC - 50	NRDC - Appendix A - 26	3) Avoidance of bathymetry likely to be associated with high-value habitat for species of particular concern, including submarine canyons and large seamounts, or bathymetry whose use poses higher risk to marine species;	This mitigation measure was eliminated from further consideration as explained in Section 5.2.1.6 of the EIS/OEIS. (Avoiding habitats and complex/steep bathymetry, including seamounts, and employing seasonal restrictions).
NRDC - 51	NRDC - Appendix A - 27	4) Avoidance of fronts and other major oceanographic features, such as the California Current and other areas with marked differentials in sea surface temperatures, which have the potential to attract offshore concentration of animals, including beaked whales;[45] [45] See, U. Carretta et al., U.S. Pacific Marine Mammal Stock Assessments: 2007 at 142 (reporting that "Baird's beaked whales have been seen primarily along the continental slope from late spring to early fall.").	Avoiding such large-scale oceanographic features would be incompatible with Navy training objectives identified in the purpose and need without demonstrable benefit.
NRDC - 52	NRDC - Appendix A - 28	5) Avoidance of areas with higher modeled takes or with high-value habitat for particular species; 6) Concentration of exercises to the maximum extent practicable in abyssal waters and in surveyed offshore habitat of low value to species;	With implementation of the Proposed Action, exposure to mid or high frequency active sonar is not a constant occurrence in the GOA TMAA. Given the manner in which sonar is typically used, there are no areas with higher modeled takes. Avoiding habitat features and limiting sonar activities as described would be incompatible with the purpose and need without

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			demonstrable benefit. See Chapter 5 regarding the analysis of similar alternatives that were rejected from further analysis.
NRDC - 53	NRDC - Appendix A - 29	7) Use of sonar and other active acoustic systems at the lowest practicable source level, with clear standards and reporting requirements for different testing and training scenarios;	Operators of sonar equipment are trained to be aware of the environmental variables affecting sound propagation. In this regard, the sonar equipment power levels are always set consistent with mission requirements. Active sonar is only used when required by the mission since it has the potential to alert opposing forces to the sonar platform's presence. The Navy remains committed to using passive sonar and all other available sensors in concert with active sonar to the maximum extent practicable consistent with mission requirements.
NRDC - 54	NRDC - Appendix A - 30	8) Expansion of the marine species "safety zone" to a 4km shutdown, reflecting international best practice, or 2 km, reflecting the standard prescribed by the California Coastal Commission;[46] [46] California Coastal Commission, Adopted Staff Recommendation on Consistency Determination CD-08606 (2007); Approved Letter from M. Delaplaine, California Coastal Commission, to Rear Adm. Len Hearing, Navy (Jan. 11, 2007).	The current power down and shut down zones are based on scientific investigations specific to MFA sonar for a representative group of marine mammals. They are based on the source level, frequency, and sound propagation characteristics of MFA sonar. The zones are designed to preclude direct physiological effect from exposure to MFA sonar. Specifically, the current power-downs at 500 yards and 1,000 yards, as well as the 200 yard shut-down, were developed to minimize exposing marine mammals to sound levels that could cause TTS and PTS. These safety zone distances were based on experiments involving distances at which the onset of TTS and PTS were identified. They are also supported by the scientific community and NMFS.
NRDC - 55	NRDC - Appendix A - 31	9) Suspension or relocation of exercises when beaked whales or significant aggregations of other species, such as killer whales, are detected by any means within the orbit circle of an aerial monitor or near the vicinity of an exercise;	Any marine mammal sighting during an exercise is reported within the chain of command in order to facilitate implementation of appropriate protective measures.
NRDC - 56	NRDC - Appendix A - 32	10) Use of simulated geography (and other work-arounds) to reduce or eliminate chokepoint exercises in near-coastal environments, particularly within canyons and channels, and use of other important habitat;	Please note that the TMAA is not considered a "near-coastal" environment and there are no chokepoint exercises proposed for the GOA proposed action. Additionally, as provided in Section 5, mitigation measures will be implemented as appropriate whenever marine mammals are detected. In this manner, the Navy mitigation measures will afford the maximum protection to all marine animals, regardless of the species or area. In addition, the concept of geographical limitations is inconsistent with the requirements for training in the TMAA. Seamounts or areas of bathymetric relief are often used by submarines to hide or mask their presence, requiring the need to train in that complex ocean environment. If the Navy were restricted from training near sea mounts or areas of bathymetric relief, they may be unable to do so when faced

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			with an actual threat. It would be impractical to train while attempting to avoid all areas of "high bathymetric relief," however that would be defined, and would certainly remove the realism needed for accomplishing this critical training.
NRDC - 57	NRDC - Appendix A - 33	11) Avoidance or reduction of training during months with historically significant surface ducting conditions, and use of power-downs during significant surface ducting conditions at other times;	This mitigation measure was eliminated from further consideration as explained in Section 5.2.1.6 of the EIS/OEIS. (Reducing power in significant surface ducting conditions).
NRDC - 58	NRDC - Appendix A - 34	12) Use of additional power-downs when significant surface ducting conditions coincide with other conditions that elevate risk, such as during exercises involving the use of multiple systems or in beaked whale habitat;	This mitigation measure was eliminated from further consideration as explained in Section 5.2.1.6 of the Draft EIS/OEIS. (Reducing power in significant surface ducting conditions).
NRDC - 59	NRDC - Appendix A - 35	13) Planning of ship tracks to avoid embayments and provide escape routes for marine animals;	This restriction is not applicable to training in the GOA TMAA. Exercises involving sonar are performed offshore in the TMAA and are thus located away from embayments.
NRDC - 60	NRDC - Appendix A - 36	14) Suspension or postponement of chokepoint exercises during surface ducting conditions and scheduling of such exercises during daylight hours;	This restriction is not applicable to training in the GOA because there are no chokepoint exercises proposed for the GOA proposed action.
NRDC - 61	NRDC - Appendix A - 37	15) Use of dedicated aerial monitors during chokepoint exercises, major exercises, and near-coastal exercises;	As stated in 5.2.1.3, airborne assets when available already monitor for the presence of marine mammals with no reported incidents where marine mammals were overlooked during an exercise or where aerial assets were unable to perform their duties while watching for marine mammals; therefore, the allocation of additional airborne assets is not well justified. In addition, the presence of additional aircraft (not involved in the exercise) near naval exercises would present safety concerns for both commercial and naval observers because ASW training exercises are dynamic, can last several hours or days, and cover large areas of ocean several miles from land. Additionally, no chokepoint exercises are proposed, and the TMAA is not considered a near-shore environment.
NRDC - 62	NRDC - Appendix A - 38	16) Use of dedicated passive acoustic monitoring to detect vocalizing species, through established and portable range instrumentation and the use of hydrophone arrays off instrumented ranges;	The Navy will continue to use its passive detection capabilities to the maximum extent practicable consistent with the mission requirements to alert training participants to the presence of marine mammals in an event location.
NRDC - 63	NRDC - Appendix A - 39	17) Modification of sonobuoys for passive acoustic detection of vocalizing species;	Sonobuoy modification is not warranted for the limited scope and type of activities as proposed in this EIS/OEIS.

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NRDC - 64	NRDC - Appendix A - 40	18) Suspension or reduction of exercises outside daylight hours and during periods of low visibility;	This mitigation measure was eliminated from further consideration as explained in Section 5.2.1.6 of the EIS/OEIS. (Suspending training at night, periods of low visibility and in high sea-states when marine mammals are not readily visible).
NRDC - 65	NRDC - Appendix A - 41	19) Use of aerial surveys and ship-based surveys before, during, and after major exercises;	Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. As stated in 5.2.1.3, airborne assets when available already monitor for the presence of marine mammals with no reported incidents where marine mammals were overlooked during an exercise or where aerial assets were unable to perform their duties while watching for marine mammals; therefore, the allocation of additional airborne assets is not well justified. In addition, the presence of additional aircraft (not involved in the exercise) near naval exercises would present safety concerns for both commercial and naval observers because ASW training exercises are dynamic, can last several hours or days, and cover large areas of ocean several miles from land.
NRDC - 66	NRDC - Appendix A - 42	20) Use of all available range assets for marine mammal monitoring;	All assets involved in training exercises in the GOA TMAA conduct surveillance of the area in which they are training. All marine mammal sightings are reported to the chain of command.
NRDC - 67	NRDC - Appendix A - 43	21) Use of third-party monitors for marine mammal detection;	This mitigation measure was eliminated from further consideration as explained in Section 5.2.1.6 of the EIS/OEIS. (Augmenting Navy lookouts on Navy vessels providing surveillance of ASW or other training events with non-Navy personnel; and Employing non-Navy observers on non-military aircraft or vessels)
NRDC - 68	NRDC - Appendix A - 44	22) Establishment of long-term research, to be conducted through an independent agent such as the National Fish and Wildlife Foundation, on the distribution, abundance, and population structuring of protected species in the GOA, with the goal of supporting adaptive geographic avoidance of high value habitat. Notably, additional critical habitat is likely to be identified in the GOA, and research should be undertaken to identify this critical habitat;	Section 5.2.1.3 of the EIS/OEIS describes the Navy's conservation measures, which include the application of adaptive management principles and the Navy's research efforts. The Navy is confident that its measures ensure continued, effective environmental stewardship. Furthermore, as a leader in environmental stewardship, the Navy will continue to refine its monitoring plan as new data is received and continue to share its information with the scientific community and the public for input.
NRDC - 69	NRDC - Appendix A - 45	23) Application of mitigation prescribed by state regulators, by the courts, by other navies or research centers, or by the U.S. Navy in the past or in other contexts;	The Navy has worked closely with NMFS to develop mitigation measures appropriate for the proposed action. Adopting mitigation measures of foreign nation navies was eliminated

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			from further consideration as explained in Section 5.2.1.6 of the EIS/OEIS.
NRDC - 70	NRDC - Appendix A - 46	24) Avoidance of fish spawning grounds and of important habitat for fish species potentially vulnerable to significant behavioral change, such as wide-scale displacement within the water column or changes in breeding behavior;	The analysis in this EIS/OEIS indicates that the proposed activities would pose no threat to fish populations, therefore this measure would be unnecessary.
NRDC - 71	NRDC - Appendix A - 47	25) Evaluating before each major exercise whether reductions in sonar use are possible, given the readiness status of the strike groups involved;	Evaluating feasibility of powerdown procedures prior to exercises was considered for all activities. The fact that a major exercise is underway does not make a power down less likely, power down procedures will be conducted consistently in the GOA.
NRDC - 72	NRDC - Appendix A - 48	26) Dedicated research and development of technology to reduce impacts of active acoustic sources on marine mammals;	As described in Section 5.2.1.3, the Navy is planning to implement a comprehensive monitoring plan to determine if there are any observable effects from training activities. The Navy takes environmental stewardship very seriously and has been and will continue to be a leading sponsor of marine mammal research. The Navy provides a significant amount of funding and support to marine research. In the past five years the agency funded over $100 million ($26 million in FY08 alone) to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals. For additional information on Navy research efforts, refer to page 5-20 of the EIS/OEIS. The Navy's mitigation measures are effective at minimizing impacts to marine mammals.
NRDC - 73	NRDC - Appendix A - 49	27) Establishment of a plan and a timetable for maximizing synthetic training in order to reduce the use of active sonar training;	The EIS/OEIS discussed the value and use of synthetic training, and specifically the limits of simulation as it applies to ASW in Section 2.3.2.4.
NRDC - 74	NRDC - Appendix A - 50	28) Prescription of specific mitigation requirements for individual classes (or sub-classes) of testing and training activities, in order to maximize mitigation given varying sets of operational needs; and	These measures were included in the EIS/OEIS in Section 5.2.1.2 – Measures for Specific Training Events. Specifically, measures for specific training events such as: MFAS activities, Lookout and watchstander responsibilities and operating procedures specific to ordnance and sonobuoy employment.
NRDC - 75	NRDC - Appendix A - 51	29) Timely, regular reporting to NOAA, state coastal management authorities, and the public to describe and verify use of mitigation measures during testing and training activities.	The Navy does provide reports to NMFS as part of the MMPA permit and those reports are available to the public via NMFS's website. Please note that monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range

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			Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS.
NRDC - 76	NRDC - Appendix A - 52	Consideration of these measures is minimally necessary to satisfy the requirements of NEPA, and we note that similar or additional measures may be required under the Marine Mammal Protection Act, Endangered Species Act, and other statutes.	This EIS/OEIS fully meets the requirements of NEPA. The Navy is in complete compliance with the Marine Mammal Protection Act, the Endangered Species Act, and all other applicable statutes.
NRDC - 77	NRDC - Appendix A - 53	**V. The Navy Fails to Properly Analyze Cumulative Impacts** In order to satisfy NEPA, an EIS must include a "full and fair discussion of significant environmental impacts." 40 C.F.R. § 1502.1. It is not enough, for purposes of this discussion, to consider the proposed action in isolation, divorced from other public and private activities that impinge on the same resource; rather, it is incumbent on the Navy to assess cumulative impacts as well, including the "impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future significant actions." Id. § 1508.7. A meaningful cumulative impact analysis must identify (1) the area in which the effects of the proposed project will be felt; (2) the impacts that are expected in that area from the proposed project; (3) other actions-past, present, proposed, and reasonably foreseeable-that have had or are expected to have impacts in the same area; (4) the impacts or expected impacts from these other actions; and (5) the overall impact that can be expected if the individual impacts are allowed to accumulate. Grand Canyon Trust v. FAA, 290 F.3d 339, 345 (D.C. Cir. 2002) (quotation and citation omitted). The, Navy "cannot treat the identified environmental concern in a vacuum." TOMAC v. Norton, 433 F.3d 852, 863 (D.C. Cir. 2006) (quoting Grand Canyon Trust, 290 F.3d at 345).	Cumulative impacts have been considered in the EIS/OEIS. As required under NEPA, the level and scope of the analysis are commensurate with the potential impacts of the action as reflected in the resource-specific discussions in Chapter 3. The EIS/OEIS considered its activities alongside those of other activities in the region. The entire EIS/OEIS provides the cumulative impacts analysis, not just Chapter 4. Chapter 3, in particular, provides the past and present impacts and environmental conditions that represent the baseline, and Chapter 3 also discusses the consequences or potential future impacts from Navy activities. Chapter 4, then, discusses the other reasonably foreseeable activities to the extent they are known and the incremental impact of the Navy's proposal when added to past, present, and future impacts.
NRDC - 78	NRDC - Appendix A - 54	The Navy's cumulative impact analysis fails to meet these basic requirements. Nowhere in its cumulative impact analysis does the Navy consider-let alone reach the conclusion-that the sum of the various environmental impacts that are enumerated will be limited. DEIS at 4-1 to	Please see response to NRDC-77.

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		27. The Navy's analysis cannot provide such support because the Navy fails to explain what the sum of these impacts is expected to be. NEPA requires more than just a recital of possible impacts: it requires the Navy to actually analyze the overall impact of the accumulation of individual impacts. Grand Canyon Trust, 290 F.3d at 345. The DEIS fails to make this analysis.	
NRDC - 79	NRDC - Appendix A - 55	The Navy must also consider the full effects of its sonar training. It simply assumes that all behavioral impacts are short-term in nature and cannot affect individuals or populations through repeated activity-even though the anticipated takes at its preferred alternative would affect the same populations.	The conclusion that sonar effects are short-term in nature is based on the analysis of the proposed sonar activities. Those activities, very short-term in nature, and spread out both temporally and geographically, are not likely to significantly impact any species of fish or marine mammal.
NRDC - 80	NRDC - Appendix A - 56	Nor does the Navy consider the potential for acute synergistic effects from sonar training. Although the DEIS discusses the potential for ship strike in the training area (DEIS 4-20 to 21), it does not consider the greater susceptibility to vessel strike of animals that have been temporarily harassed or disoriented by certain noise sources. The absence of analysis is particularly glaring in light of the Haro Strait incident, in which killer whales and other marine mammals were observed fleeing away from the sonar vessel at high speeds.[47] Neither does the Navy consider the synergistic effects of noise with other stressors in producing or magnifying a stress-response.[48] For these reasons alone, the Navy should have concluded that the cumulative and synergistic impacts from sonar training are significant and focused its efforts to analyze and develop mitigation measures to avoid those impacts. [47] Christopher Dunagan, Navy Sonar Incident Alarms Experts, Bremerton Sun, May 8, 2003. [48] A.J. Wright, N. Aguilar Soto, AL. Baldwin, M. Bateson, C.M. Beale, C.Clark, T. Deak, E.F. Edwards, A Fernandez, A Godinho, L. Hatch, A. Kakuschke, D. Lusseau, D. Martineau, L.M. Romero, L. Weilgart, B. Wintle, G. Notarbartolo di Sciara, and V. Martin, Do marine mammals experience stress related to anthropogenic noise?, 20 International Journal of Comparative Psychology, 274-316 (2007); see also Andrew J. Wright, Natacha Aguilar Soto, Ann L. Baldwin, Melissa Bateson, Colin M. Beale, Charlotte Clark, Terrence Deak, Elizabeth F. Edwards, Antonio Fernandez, Ana Godinho, Leila Hatch, Antje Kakuschke, David Lusseau, Daniel Martineau, L. Michael Romero, Linda Weilgart, Brendan Wintle, Giuseppe Notarbartolo-di-Sciara, and Vidal Martin, Anthropogenic	There has been no scientific reports indicating that marine mammals may be more susceptible to vessel strikes as a result of exposure to sonar. As discussed, for example in section 3.8.3.4 concerning right whales, sound sources have been specifically used to deter ship strikes and in other cases as acoustic deterrence devices to keep marine mammals from becoming entangled in fishing nets. The Navy has not found any information to suggest that animals exposed to MFA/HFA sonar would be more susceptible to vessel collisions. Additionally, Appendix F describes Haro Strait incident in detail and also highlights the variability of observer reports with regards to orca behavior on May 5, 2003 which included observer reports ranging from the orca resting along the shoreline, to having high rates of active surface behavior, to a determination they were "annoyed"; None of these would seem create a greater susceptibility to a vessel strike. Chapter 4 presents an analysis of cumulative impacts from Navy training activities. As detailed, Navy training activities constitute a very small contribution to human activities in the area. Specifically regarding cumulative acoustic impacts, see section 4.2.8.3. Regarding mitigation measures used during training with active mid-frequency sonar, see Chapter 5.

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		noise as a stressor in animals: a multidisciplinary perspective. 20 International Journal of Comparative Psychology, 250-273 (2007).	
NRDC - 81	NRDC - Appendix A - 57	The Navy acknowledges that the GOA is crowded with human and military activities, many of which introduce noise, chemical pollution, debris, and vessel traffic into the habitat of protected species. DEIS at 4-1 to 7; 4-18-27. Yet it inexplicably fails to conclude what the cumulative effects will be for all those activities. Given the scope of the proposed action, the deficiencies of the Navy's cumulative impacts assessment represents a critical failure of the DEIS. At a minimum, the Navy must evaluate the potential for cumulative impacts on populations that would occur in and near the GOA, clearly define the extent of expected cumulative impacts, and assess the potential for synergistic adverse effects (such as from noise in combination with ship-strikes).	Please see Chapter 4 regarding the cumulative effects analyses in the EIS/OEIS that deals with the combined cumulative and, as applicable, the known synergistic effects of Navy's proposed actions on the resources in the TMAA. In general, Navy training is a very small subset of the activities taking place in the TMAA and thus in comparison contributes very to any potential cumulative impacts in the area. Specifically for a broad discussion of cumulative impacts on Marine Mammals, see Section 4.2.8. For a discussion of cumulative impacts relating to Marine Mammals and Ship Strikes see Section 4.2.8.2; this section in particular highlights the small contribution of Navy training to the cumulative impacts taking place in the TMAA. For a discussion of Anthropogenic Sound ("noise") see Section 4.2.8.3. For detailed information, see Section 3.8 as analyzed for each species in the TMAA. For example, see Section 3.8.3.3 regarding the context for ship strikes of humpback whales in Alaska waters; the same is repeated for all other species for which ship strike data is available. The "Other Threats" sub-section in the species write-ups also contains a discussion of "anthropogenic noise" as it relates to the species.
NRDC - 82	NRDC - Appendix A - 59	**VI. The Navy Fails to Properly Analyze Reasonable Alternatives** NEPA requires agencies to consider alternatives to their proposed actions. To comply with NEPA, an EIS must "inform decision-makers and the public of the reasonable alternatives which would avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. This alternatives requirement has been described in regulation as "the heart of the environmental impact statement." Id. § 1502.14. The courts describe the alternatives requirement equally emphatically, citing it as the "linchpin" of the EIS. Monroe County Conservation Council v. Volpe, 472 F.2d 693 (2d Cir. 1972). The agency must therefore "[r]igorously explore and objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." 40 C.F.R. § 1502.14(a). Consideration of alternatives is required by (and must conform to the independent terms of) both sections 102(2)(C) and 102(2)(E) of NEPA. Here, the Navy's	The Navy complied with NEPA requirements in the development and consideration of alternatives. This FEIS/OEIS analyzes all alternatives in Section 2.3 and explains why the Navy has considered but eliminated alternatives in Section 2.3.2. As explained in Section 2.3.2, a reduction in levels of training within the GOA ATAs would not support the Navy's Purpose and Need and was therefore eliminated from further consideration. Further information can be found in response to MMC – 2. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.

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		alternatives analysis misses the mark. **A. Failure to Identify Environmental Impact-Based Alternatives** The Navy claims it "considers potential environmental impacts" while executing its responsibilities under federal law, including NEPA. DEIS at 1-1. But the Navy's alternatives were not selected to "inform decision-makers and the public" of how the Navy could "avoid or minimize adverse impacts or enhance the quality of the human environment." 40 C.F.R. § 1502.1. Instead, as discussed in the DEIS and below, the Navy chose alternatives based on factors unrelated to the proposed action's environmental impacts.	
NRDC - 83	NRDC - Appendix A - 60	Further, at no point in the DEIS does the Navy discuss how the alternatives pose different environmental choices for the public and decision makers. The DEIS fails entirely to comply with NEPA's regulations, requiring the Navy to "present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among option by the decision maker and the public." 40 C.F.R. § 1502.14. The Navy fails to sharply define the environmental issues applicable to each alternative and include these differences in a comparison of alternatives. There is simply no comparison of the risks and benefits of each alternative site showing what is and is not known and what species and habitats would be most at risk from each alternative.	The EIS/OEIS presents the environmental impacts of the proposal and the alternatives in a directly comparative manner within the executive summary as well as at the conclusion of each resource section. Within each resource section, impacts from the No Action Alternative are presented, followed by thorough discussions of Alternative 1 and Alternative 2 that discuss potential impacts of the action alternatives as they relate to impacts presented under the No Action Alternative. In this manner, the EIS/OEIS does indeed satisfy NEPA regulations to "present the environmental impacts of the proposal and the alternatives in comparative form".
NRDC - 84	NRDC - Appendix A - 61	**B. Identification of Alternative Sites** The DEIS does not include any discussion of alternative sites, instead proposing a No Action alternative (maintaining the current level of activities), Alternative 1 (increasing training activities, including sonar training), and the preferred Alternative 2 (increasing training activities, sonar training, additional strike exercises and range enhancements). The Navy's analysis is devoid of geographic alternatives. The information the Navy does include indicates that factors of convenience and cost dominated the decision. Factors of mere convenience alone cannot dictate an agency's choice of alternatives to evaluate in an EIS. An agency must discuss all reasonable alternatives-those that will accomplish the purpose and need of the agency and are practical and feasible-not simply those it finds most	The statement of the purpose and need for the agency action appropriately defines the range of alternatives to be addressed in an EIS/OEIS. In identifying the purpose and need for a major federal action, the agency must consider the goals of Congress, and federal law such as those expressed in the agency's statutory authorization to act. With regard to the GOA EIS/OEIS, the purpose and need for the agency action is clearly defined. The purpose and need for Proposed Action is to provide a training environment consisting of ranges, training areas, and range instrumentation with the capacity and capabilities to fully support required training tasks for operational units. As the EIS/OEIS states, the purpose and need furthers the Navy's execution of its statutory roles and responsibilities under Title 10 of the United States Code. Please note that Navy training is not a matter of cost or convenience. Navy assets must travel a long way to participate

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		convenient. 40 C.F.R. § 1502.14.	in joint training activities to receive the training required to fulfill its Title 10 responsibility.
NRDC - 85	NRDC - Appendix A - 62	"The primary purpose of the impact statement is to compel federal agencies to give serious weight to environmental factors in making discretionary choices." /-291 Why? Ass'n v. Bums, 372 F.Supp. 233, 247 (D. Conn. 1974). If an agency is permitted to consider and compare the environmental impacts of its proposed action with only equally convenient alternatives-and permitted to omit from such analysis any alternatives that are less convenient, no matter that they might result in significant environmental benefits-this purpose would be thwarted. Carefully siting the activities proposed to occur in the range to avoid concentrations of vulnerable and endangered species and high abundances of marine life is the most critical step the Navy can take in reducing the environmental impacts of this project. Because the Navy has failed to undertake an alternatives analysis that allows it to make an informed siting choice, however, the DEIS is inadequate and must be revised.	The Navy has developed and fully analyzed appropriate alternatives based on this statement of the purpose and need for the Proposed Action. The EIS/OEIS does not, as this comment suggests, summarily dismiss exclusions from its alternatives analysis. As the EIS/OEIS states, and as stated in public articulations of the professional military judgment of senior Navy leaders, alternatives that would impose limitations on training locations within the GOA ATA's, would not support the purpose and need. The analysis mandated by NEPA is not an evaluation of alternative means to accomplish the general goal of an action. Rather, alternatives to be evaluated should be those that reasonably satisfy the specific purpose and need for the agency action. The underlying need is to conduct training of a specific nature, type, and scope that is required to ensure Navy personnel and units are fully trained. The EIS/OEIS appropriately limits its analysis to alternatives that meet the Navy's congressionally mandated training mission. Moreover, the Navy has proposed extensive mitigation measures to reduce any potential impacts on marine species and marine resources.
NRDC - 86	NRDC - Appendix A - 63	**C. Other Reasonable Alternatives** The DEIS fails to consider any alternatives beyond increasing the level of training. Therefore, many reasonable alternatives are missing from the Navy's analysis that might fulfill that purpose while reducing harm to marine life and coastal resources. For example: (1) The DEIS fails entirely to consider avoiding seasonal habitat, or any other seasonal variation in marine life abundance (such as migration routes). Omitting even the mere consideration of any alternative that recognizes the need to protect endangered and sensitive marine life is unacceptable.	See response to NRDC – 85.
NRDC - 87	NRDC - Appendix A - 64	(2) The DEIS fails to include a range of mitigation measures among its alternatives. Many such measures have been employed by the U.S. Navy in other contexts, as discussed above; and there are many others that should be considered. Such measures are reasonable means of reducing harm to marine life and other resources on the proposed range, and their omission from the alternatives analysis renders that analysis inadequate.	The range of mitigations has been discussed in Section 5 and those apply to all alternatives. The mitigations proposed have been reviewed by Navy and NMFS based on their effectiveness, practicality, and impact on the military readiness activity as required under the amendments to MMPA.

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NRDC - 88	NRDC - Appendix A - 65	(3) The Navy's statement of purpose and need contains no language that would justify the limited set of alternatives that the Navy considers (or the alternative it ultimately prefers). Yet it is a fundamental requirement of NEPA that agencies preparing an EIS specify their project's "purpose and need" in terms that do not exclude full consideration of reasonable alternatives. 40 C.F.R. § 1502.13; City of Carmel-by-the-Sea v. United States Dep't of Transp. , 123 F.3d 1142, 1155 (9th Cir. 1997) (citing Citizens Against Burlington, Inc. v. Busey, 938 F.2d 190, 196 (D.C. Cir. 1991)). "The existence of a viable but unexamined alternative renders an environmental impact statement inadequate," Idaho Conservation League v. Mumma, 956 F.2d 1508, 1519 (9th Cir. 1992), and an EIS errs when it accepts "as a given" parameters that it should have studied and weighed. Simmons v. U.S. Army Corps of Eng'rs, 120 F.3d 664, 667 (7th Cir. 1997). In sum, the DEIS shortchanges or omits from its analysis reasonable alternatives that might achieve the Navy's core aim of testing and training while minimizing environmental harm. For these reasons, we urge the Navy to revise its DEIS to adequately inform the public of all reasonable alternatives that would reduce adverse impacts to whales, fish, and other resources. 40 C.F.R. § 1502.1.	Section 1.1 of the EIS/OEIS identifies that the core of the EIS/OEIS is the development and analysis of different alternatives for achieving the Navy's objectives. Alternatives are not required to avoid environmental harm. Alternatives development is a complex process, particularly in the dynamic context of military training. The touchstone for this process is a set of criteria that respond to the naval readiness mandate as it is implemented in the GOA ATA's. The criteria for developing and analyzing alternatives to meet these objectives are set forth in Section 2.3.1. This Section in 2.3.1, combined with the purpose and need statement in Section 1.4 (along with background information that precedes this statement) adequately justifies the set of alternatives presented in the EIS/OEIS.
NRDC - 89	NRDC - Appendix A - 66	**VII. The Navy Fails to Analyze the Impacts on Wildlife Viewing Interests and Recreation** Just as it fails to consider the direct, indirect, and cumulative impacts of increased training in the GOA on the region's marine mammals and other fish and wildlife, the DEIS does not adequately consider the effects on wildlife viewing and other wildlife dependent recreational interests. The DEIS makes no mention of the value lost from the harm to marine mammals that attract a number of our organizational members and members of the public to the potentially affected areas of the GOA. Nor does it address the potential economic value lost from decreased tourism (e.g., whale watching, cruise ships, etc.), particularly those areas centered on observing whales and other marine mammals in their natural habitats. One of NEPA's explicit purposes is to "assure esthetically and culturally pleasing surroundings," 42 U.S.C. 4331(b)(2), and case law makes clear that an agency must adequately consider such recreational impacts in its NEPA analysis. See, e.g., Lujan v. NWF, 497 U.S. 871, 887 (1990) ("no doubt that recreational	These potential impacts were analyzed in the EIS/OEIS in Section 3.12 – Socioeconomics. In short, the proposed activities, largely similar in number and scope to those conducted for years, have not negatively impacted these resource areas in the past nor are they expected to in the future. Any recreational area and tourism impacts have been considered within Socioeconomics – 3.12 and any impacts relating to EO 12898 or EO13045 have been analyzed within Environmental Justice and Protection of Children – 3.13. None of these resource sections show an appreciable effect as a result of Navy training. Furthermore, no restrictions on vessel traffic or transits would occur, even during Navy training activities.

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		use and aesthetic enjoyment are among the sorts of interests NEPA [was] specifically designed to protect"); LaFlamme v. FERC, 852 F.2d 389, 401 (1988) (because "there were substantial questions raised regarding whether the project may significantly affect recreational use in the project area, and that PERC failed to explain or discuss" these impacts, the court found that "this record reflects a decision which is neither 'fully informed or well-considered,>t, and therefore concluded the agency's decision not to prepare an EIS was unreasonable).	
NRDC - 90	NRDC - Appendix A - 67	**VIII. Project Description and Meaningful Public Disclosure** Disclosure of the specific activities contemplated by the Navy is essential if the NEPA process is to be a meaningful one. See, e.g., LaFlamme v. F.E.R.C, 852 F.2d 389,39 (9th Cir. 1988) (noting that NEPA's goal is to facilitate "widespread discussion and consideration of the environmental risks and remedies associated with [a proposed action]").	The EIS/OEIS provides a complete and thorough description of the proposed activities.
NRDC - 91	NRDC - Appendix A - 68	For meaningful public input, the Navy must describe source levels, frequency ranges, duty cycles, and other technical parameters relevant to determining potential impacts on marine life. The DEIS provides some of this information, but it fails to disclose sufficient information about active sonobuoys, acoustic device countermeasures, training targets, or range sources that would be used during the exercises. DEIS at Appendix H. And the DEIS gives no indication of platform speed, pulse length, repetition rate, beam widths, or operating depths-that is, most of the data that the Navy used in modeling acoustic impacts.	To the extent possible, the EIS/OEIS presents acoustic source and technical information in Appendix H. Additionally, Appendix D discusses some of this information as it relates to acoustic modeling efforts.
NRDC - 92	NRDC - Appendix A - 69	The Navy-despite repeated requests-has not released or offered to release CASS/GRAB or any of the other modeling systems or functions it used to develop the biological risk function or calculate acoustic harassment and injury. See, e.g., DEIS at Appendix D.	The CASS/GRAB program is proprietary and not available for public release, however, approximate results can be obtained using other mathematical models commonly available to those with the technical expertise to utilize those tools.
NRDC - 93	NRDC - Appendix A - 70	In addition, the Navy has also ignored repeated Freedom of Information Act requests regarding information and reports cited in the DEIS. These models, reports, and requests for information must be made available to the public, including the independent scientific community, for public comment to be meaningful under NEPA and the Administrative Procedure Act. 40 C.F.R. §§ 1502.9(a), 1503.1(a) (NEPA); 5	The model has been evolving in response to new data and will be subject to independent peer review for conferences or journal submissions. The EIS/OEIS provides all source levels, frequency ranges, duty cycles, and other technical parameters relevant to determining potential impact on marine life unless this information was classified (See Chapter 2, Tables 2-2 and 2-3).

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		U.S.C. § 706(2)(0) (APA). In addition, guidelines adopted under the Data (or Information) Quality Act also require their disclosure. The Office of Management and Budget's guidelines require agencies to provide a "high degree of transparency" precisely "to facilitate reproducibility of such information by qualified third parties" (67 Fed. Reg. 8452, 8460 (Feb. 22,2002»; and the Defense Department's own data quality guidelines mandate that "influential" scientific material be made reproducible as well. We encourage the Navy to contact us immediately to discuss how to make this critical information available.	The Navy has not ignored FOIA requests, but as stated above, some of the information is export controlled and not available for public release. However, based on the information provided in the EIS/OEIS, others with the required technical expertise can use the existing information to calculate similar results. Approximate results can be obtained using other mathematical models commonly available to those with the technical expertise to utilize those tools. The NEPA requirements were met in the EIS/OEIS. The analysis contained within the EIS/OEIS is complete and fully supports the conclusions.
NRDC - 94	NRDC - Appendix A - 71	**IX. Compliance With Other Applicable Laws** A number of other statutes and conventions are implicated by the proposed activities. Among those that must be disclosed and addressed during the NEPA process are the following: (1) The Marine Mammal Protection Act ("MMPA"), 16 U.S.C. § 1361 et seq., which requires the Navy to obtain a permit or other authorization from NMFS or the U.S. Fish and Wildlife Service prior to any "take" of marine mammals. The Navy must apply for an incidental take permit under the MMPA, and NRDC will submit comments regarding the Navy's application to NMFS at the appropriate time.	The Navy is fully engaged in the MMPA process with NMFS as described in Chapter 6 of the EIS/OEIS. In November 2009, NMFS received the Navy's application for the incidental take of marine mammals incidental to Navy training activities in the GOA TMAA. A Notice of Rulemaking was published on 03 Feb, 2010, and the comment period ended on 05 Mar, 2010.
NRDC - 95	NRDC - Appendix A - 72	(2) The Endangered Species Act, 16 U.S.C. § 1531 et seq., which requires the Navy to enter into formal consultation with NMFS or the U.S. Fish and Wildlife Service, and receive a legally valid Incidental Take Permit, prior to its "take" of any endangered or threatened marine mammals or other species, including fish, sea turtles, and birds, or its "adverse modification" of critical habitat. See, e.g., 1536(a)(2); Romero-Barcelo v. Brown, 643 F.2d 835 (1st Cir. 1981), rev'd on other grounds, Weinberger v. Romero-Barcelo, 456 U.S. 304, 313 (1982). Given the scope and significance of the actions and effects it proposes, the Navy must engage in formal consultation with NMFS and the U.S. Fish and Wildlife over the numerous endangered and threatened species in the GOA.	The Navy has initiated consultation with NMFS on the potential that implementation of the proposed action may affect listed species. Additionally, please see response to Greg Brown – 17.
NRDC - 96	NRDC - Appendix A - 73	(3) The Coastal Zone Management Act, and in particular its federal consistency requirements, 16 U.S.C. § 1456(c)(l)(A), which mandate that activities that affect the natural resources of the coastal zone-whether they are located "within or outside the coastal zone"-be carried out "in a	Please see response to Carolyn Heitman – 33.

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		manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs." The Navy must fulfill its CZMA commitments along the Alaska coast.	
NRDC - 97	NRDC - Appendix A - 74	(4) The Magnuson-Stevens Fisheries Conservation and Management Act, 16 U.S.C. § 1801 et seq. ("MSA"), which requires federal agencies to "consult with the Secretary [of Commerce] with respect to any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken" that "may adversely affect any essential fish habitat" identified under that Act. 16 U.S.C. § 1855 (b)(2). In turn, the MSA defines essential fish habitat as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity." 16 U.S.C. § 1802 (10). The GOA contains such habitat. As discussed at length above, anti-submarine warfare exercises alone have the significant potential to adversely affect at least the waters, and possibly the substrate, on which fish in these areas depend. Under the MSA, a thorough consultation is required.	The Navy, as put forth in the Final EIS/OEIS, has concluded that impacts to EFH would be minimal and temporary, which is the Navy's determination of what constitutes an adverse impact (ref. NMFS regs, life in EFHA).
NRDC - 98	NRDC - Appendix A - 75	(5) The Marine Protection, Research and Sanctuaries Act, 33 U.S.C. § 1401 et seq., which requires federal agencies to consult with the Secretary of Commerce if their actions are "likely to destroy, cause the loss of, or injure any sanctuary resource." 16 U.S.C. § 1434(d)(1). Since the Navy's exercises would cause injury and mortality of species, consultation is clearly required if sonar use takes place either within or in the vicinity of the sanctuary or otherwise affects its resources. Since sonar may impact sanctuary resources even when operated outside its bounds, the Navy should indicate how close it presently operates, or foreseeably plans to operate, to such sanctuary and consult with the Secretary of Commerce as required. In addition, the Sanctuaries Act is intended to "prevent or strictly limit the dumping into ocean waters of any material that would adversely affect human health, welfare, or amenities, or the marine environment, ecological systems, or economic potentialities" (33 U.S.C. § 1401(b», and prohibits all persons, including Federal agencies, from dumping materials into ocean waters, except as authorized by the Environmental Protection Agency. 33 U.S.C. §§ 1411, 1412(a). The Navy has not indicated its intent to seek a permit under the statute.	The Marine Protection, Research and Sanctuaries Act is addressed in Sections 3.2, 3.3 of the FEIS/OEIS. The Navy is in compliance with the Marine Protection, Research and Sanctuaries Act; there are no National Marine Sanctuaries located within the boundaries of the TMAA or in the state of Alaska. The expenditure of training materials in the GOA during Navy activities does not fall within the statutory definition of "dumping" under MPRSA.

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NRDC - 99	NRDC - Appendix A - 76	(6) The Migratory Bird Treaty Act, 16 U.S.C. § 703 et seq. ("MBTA"), which makes it illegal for any person, including any agency of the Federal government, "by any means or in any manner, to pursue, hunt, take, capture, [or] kill" any migratory birds except as permitted by regulation. 16 U.S.C. § 703. After the District Court for the D.C. Circuit held that naval training exercises that incidentally take migratory birds without a permit violate the MBTA, (see Center for Biological Diversity v. Pirie, 191 F. Supp. 2d 161 (D.D.C. 2002) (later vacated as moot», Congress exempted some military readiness activities from the MBTA but also placed a duty on the Defense Department to minimize harms to seabirds. Under the new law, the Secretary of Defense, "shall, in consultation with the Secretary of the Interior, identify measures-- (1) to minimize and mitigate, to the extent practicable, any adverse impacts of authorized military readiness activities on affected species of migratory birds; and (2) to monitor the impacts of such military readiness activities on affected species of migratory birds." Pub.L. 107-314, § 315 (Dec. 2, 2002). As the Navy acknowledges, many migratory birds occur within the GOA. The Navy must therefore consult with the Secretary of the Interior regarding measures to minimize and monitor the effects of the proposed range on migratory birds, as required.	As stated in the EIS/OEIS (Sections 3.9.2.4- 3.9.2.6), implementation of the alternatives including the Proposed Action would not have a significant impact on any population of migratory birds, would comply with the MBTA, and would not require a permit under the MBTA.
NRDC - 100	NRDC - Appendix A - 77	(7) Executive Order 13158, which sets forth protections for marine protected areas ("MPAs") nationwide. The Executive Order defines MPAs broadly to include "any area of the marine environment that has been reserved by Federal, State, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein." E.O. 13158 (May 26, 2000). It then requires that "[e]ach Federal agency whose actions affect the natural or cultural resources that are protected by an MPA shall identify such actions," and that, "[t]o the extent permitted by law and to the maximum extent practicable, each Federal agency, in taking such actions, shall avoid harm to the natural and cultural resources that are protected by an MPA." [d. The Navy must therefore consider and, to the maximum extent practicable, must avoid harm to the resources of all federally- and state-designated marine protected areas. The proposed activities also implicate the Clean Air Act and Clean Water Act as well as other statutes protecting the	The Navy has followed the guidelines of EO 13158. Additionally, there are no federally designated MPAs in the TMAA. Furthermore, Sections 3.1, Air Quality, and Section 3.3, Water Resources, evaluate the effects of Navy training activities on air and water quality, respectively. Navy training activities in the TMAA would not result in violations of any State or federal air or water quality regulation. Cumulative effects of air quality and water quality are analyzed in Sections 4.2.1 and 4.2.3, respectively. Finally, the information on the Clean Water Act in Section 3.3.2.2 is not applicable to training in the Gulf of Alaska because training activities occur further than 12 nautical miles from shore. All Navy waste discharges beyond 12 nautical miles would be conducted in accordance with standard operating procedures and best management practices as outlined in OPNAVINST 5090.1C, and as described in Section 3.3.1.2 of the EIS/OEIS. Discussion of wastewater discharges in Section 3.3.2.2 of the Final EIS/OEIS has been deleted.

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		public health. The Navy must comply with these and other laws	
NRDC - 101	NRDC - Appendix A - 78	**X. Conflicts with Federal State and Local Land-Use Planning** NEPA requires agencies to assess possible conflicts that their projects might have with the objectives of federal, regional, state, and local land-use plans, policies, and controls. 40 C.F.R. § 1502.16(c). The Navy's training and testing activities may affect resources in the coastal zone and within other state and local jurisdictions, in conflict with the purpose and intent of those areas. The consistency of Navy operations with these landuse policies must receive more thorough consideration.	The proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Furthermore, the Navy is in compliance with the CZMA. For more information on CZMA requirements, please see response to Carolyn Heitman - 33.
NRDC - 102	NRDC - Appendix B	Appendix B – Impacts of Sonar	The issues addressed in this Appendix were responded to directly within the NRDC comments above.
NRDC - 103	NRDC - Appendix C	Appendix C – CRITIQUE OF THE RISK ASSESSMENT MODEL EMPLOYED TO CALCULATE TAKES IN THE HAWAII RANGE COMPLEX SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT David E. Bain, Ph.D.	This appendix contains the individual comments made by Dr. Bain, and are individually addressed below.
NRDC - 104	NRDC - Appendix C David Bain - 1	[Provided as appendix to Kiekow (Natural Resources Defense Council) comment] CRITIQUE OF THE RISK ASSESSMENT MODEL EMPLOYED TO CALCULATE TAKES IN THE HAWAII RANGE COMPLEX SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT David E. Bain, Ph.D. Abstract 1. Rather than using a fixed received level threshold for whether a take is likely to occur from exposure to mid-frequency sonar, the Navy proposed a method for incorporating individual variation. Risk is predicted as a function of three parameters: 1) a basement value below which takes are unlikely to occur; 2) the level at which 50% of individuals would be taken; and 3) a sharpness parameter intended to reflect the range of individual variation. This paper reviews whether the parameters employed are based on the best available science, the implications of uncertainty in the values, and biases and limitations in the model. Data were incorrectly interpreted when calculating parameter values, resulting in a model that underestimates takes.	The commenter stated that data were incorrectly interpreted by NMFS when calculating parameter values, resulting in a model that underestimates takes. NMFS, in its regulatory capacity for the MMPA, chose the data sets, interpreted the data, and set parameters for the risk function analysis to quantify exposures to mid-frequency sound sources that NMFS may classify as Level B takes for military readiness activities. Of primary importance to the commenter was that the risk function curves specified by NMFS do not account for a wide range of frequencies from a variety of sources (e.g., motor boats, seismic survey activities, “banging on pipes”). In fact, all of the commenter’s comments concerning “data sets not considered” by NMFS relate to sound sources that are either higher or lower in frequency than MFA sonar, are contextually different (such as those presented in whale watch vessel disturbances or oil industry activities), or are relatively continuous in nature as compared to intermittent sonar pings. These sounds from data sets not considered have no relation to the frequency or duration of a typical Navy MFA sonar as described in the EIS/OEIS. As discussed above and in the EIS/OEIS, NMFS selected data sets that were relevant to MFA sonar sources and selected

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			parameters accordingly. In order to satisfy the commenter's concern that a risk function must be inherently precautionary, NMFS could have selected data sets and developed parameters derived from a wide variety of sources across the entire spectrum of sound frequencies in addition to, or as substitutes for, those that best represent the Navy's MFA sonar. The net result, however, would have been a risk function that captures a host of behavioral responses beyond those that are biologically significant as contemplated by the definition of Level B harassment under the MMPA applicable to military readiness activities. The commenter's specific comments and the Navy's responses are provided below.
NRDC - 105	NRDC - Appendix C David Bain - 2	3. Errors included failure to recognize the difference between the mathematical basement plugged into the model, and the biological basement value, where the likelihood of observed and predicted takes becomes non-negligible; using the level where the probability of take was near 100% for the level where the probability of take was 50%; and extrapolating values derived from laboratory experiments that were conducted on trained animals to wild animals without regard for the implications of training; and ignoring other available data, resulting in a further underestimation of takes.	Given the results of the modeling for the GOA EIS/OEIS, having a lower basement value would not result in any significant number of additional takes. This was demonstrated in the Draft EIS/OEIS (Section 3.8, Table 3.8-5 on page 3.8-103) showing that less than 1% of the predicted number of harassments resulted from exposures below 140 dB. Another point the commenter articulates is that the criteria used to establish the risk function parameters should reflect the biological basement where any reaction is detectable. The MMPA was not intended to regulate any and all marine mammal behavioral reactions. Congress amended the MMPA to make clear its intention with the amendment to the MMPA for military readiness activities as enumerated in the following National Defense Authorization Act of 2004 clarification - (i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A Harassment]; or (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered. NMFS, in its regulatory capacity for the MMPA, chose the data sets and parameters for use in the risk function analysis to regulate military readiness activities. Congress, by amending the MMPA, specifically is not regulating all conceivable behavioral reactions. NMFS, as a cooperating agency and in its role as the MMPA regulator, reviewed all available applicable data and determined that three specific data sets should be used to develop the criteria. NMFS then applied the risk function to

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			predict exposures that NMFS may classify as harassment. NMFS developed two risk curves based on the Feller adaptive risk function, one for odontocetes and one for mysticetes, with input parameters of B=120 dB, K=45, 99% point = 195 dB, 50% point = 165 dB.
NRDC - 106	NRDC - Appendix C David Bain - 3	4. In addition, uncertainty, whether due to inter-specific variation or parameter values based on data with broad confidence intervals, results in the model being biased to underestimate takes.	The risk function methodology assumes variations in responses within the species and was chosen specifically to account for uncertainties and the limitations in available data. NMFS considered all available data sets and determined it to be the best data currently available. While the data sets have limitations, they constitute the best available science.
NRDC - 107	NRDC - Appendix C David Bain - 4	5. The model also has limitations. For example, it does not take into account social factors, and this is likely to result in the model underestimating takes. This analysis has important management implications.	The commenter was concerned that if one animal is “taken” and leaves an area then the whole pod would likely follow. As explained in Appendix D of the EIS/OEIS, the model does not operate on the basis of an individual animal but quantifies exposures NMFS may classify as takes based on the summation of fractional marine mammal densities. Because the model does not consider the many mitigation measures that the Navy utilizes when it is using MFA sonar, to include MFA sonar power down and power off requirements should mammals be spotted within certain distances of the ship, if anything, it over estimates the amount of takes given that large pods of animals should be easier to detect than individual animals.

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NRDC - 108	NRDC - Appendix C David Bain - 5	6. First, not only do takes occur at far greater distances than predicted by the Navy's risk model, the fact that larger areas are exposed to a given received level with increasing distance from the source further multiplies the number of takes. This implies takes of specific individuals will be of greater duration and be repeated more often, resulting in unexpectedly large cumulative effects. Second, corrections need to be made for bias, and corrections will need to be larger for species for which there are no data than for species for which there are poor data.	Modeling accounts for exposures NMFS may classify as takes at distances up to 105 km as described in the Draft EIS/OEIS (Table 3.8-5). As discussed in Appendix D of the EIS/OEIS, the GOA TMAA contains a total of 20 distinct environmental provinces with specific sound propagation characteristics. These represent the various combinations of six bathymetry provinces, two Sound Velocity Profile provinces, and four high frequency bottom loss classes. Based on these different provinces, the Navy identified 11 different representative sonar modeling areas to fully encompass sound attenuation within the GOA TMAA. Within these provinces, sound attenuated down below 138 dB at distances out to about 105 km (Table 3.8-5). Using these sound propagation characteristics, the risk function modeling for the GOA EIS/OEIS resulted in less than 1% of the exposures that NMFS may classify as a take occurring below 140 dB. The area encompassed by this sound propagation, as determined by NMFS for exposures that may constitute harassment, avoids a bias towards underestimation because the risk function parameters were designed with this in mind.
NRDC - 109	NRDC - Appendix C David Bain - 6	7. Third, the greater range at which takes would occur requires more careful consideration of habitat-specific risks and fundamentally different approaches to mitigation.	Section 5.2.1.6 of the Final EIS/OEIS evaluates alternative and/or additional mitigations, specifically, as they relate to potential mitigation approaches. The examples of the fundamentally different approaches noted in the comment were addressed in this section of the Draft EIS/OEIS. In addition, NMFS has identified general goals of mitigation measures. These goals include avoidance or minimization of injury or death, a reduction in the number of marine mammals exposed to received levels when these are expected to result in takes, a reduction in the number of times marine mammals are exposed when these are expected to result in takes, a reduction in the intensity of exposures that are expected to result in takes, and reduction in adverse effects to marine mammal habitat. In this regard, NMFS and Navy have identified mitigation measures that are practicable and reasonably effective. For example, the safety zones reduce the likelihood of physiological harm, the number of marine mammals exposed, and the intensity of those exposures. NMFS and Navy have determined that mitigation measures in conjunction with our understanding of sonar use have protected species and populations so that impacts have been negligible in the Eastern Pacific. Mitigation measures that are

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			practicable involve those that reduce direct physiological effects within the TTS and PTS thresholds.
NRDC - 110	NRDC - Appendix C David Bain - 7	8. The population effects of Level A takes on populations are relatively easy to assess, as individuals that are killed are obviously removed from the population, and those that are injured are more likely to die whenever the population is next exposed to stress.	Navy agrees with the comment and notes that the recently documented increase in many populations of endangered and non-endangered species in the Eastern Pacific, where decades of sonar use, training, and RDT&E have occurred, would make it seem unlikely that those activities are having a significant effect on populations via Level A takes.
NRDC - 111	NRDC - Appendix C David Bain - 8	9. Temporary Threshold Shifts in captive marine mammals are commonly used as an index of physical harm (e.g., Nachtigall et al. 2003, Finneran et al. 2002 and 2005, Kastak et al. 2005). Limiting experimental noise exposure to levels that cause temporary effects alleviates ethical concerns about deliberately causing permanent injury. However, repeated exposure to noise that causes temporary threshold shifts can lead to permanent hearing loss. In fact, chronic exposure to levels of noise too low to cause temporary threshold shifts can cause permanent hearing loss.	This issue was recognized and discussed as presented in the Draft EIS/OEIS (Section 3.8.7.2). Based on prior National Oceanic and Atmospheric Administration rule makings, NMFS established that exposures resulting in Level A and B harassment cannot be considered to overlap in an analysis of impacts, otherwise the regulatory distinction between the two criteria would be lost and the take quantification required would be ambiguous. To facilitate the regulatory process, a clear and distinct division between Level A and Level B harassments was maintained as required by NMFS in its role as the regulator and a cooperating agency on the GOA EIS/OEIS.
NRDC - 112	NRDC - Appendix C David Bain - 9	10. Changes in behavior resulting from noise exposure could result in indirect injury in the wild. A variety of mechanisms for Level B harassment to potentially lead to Level A takes have been identified.	In Section 3.8.7.3 on page 3.8-98 of the EIS/OEIS, the text makes clear that the 120 dB basement value was recommended by National Marine Fisheries Service and for a many reasons including the risk approaches zero making calculations are impractical and based on a broad overview of the levels at which multiple species have been reported responding to a variety of sound sources citing to (DoN 2008, NOAA 2009).
NRDC - 113	NRDC - Appendix C David Bain - 10	Captive cetaceans Studies of captive marine mammals provide an excellent setting for identifying direct effects of sound. E.g., one of the datasets employed by the Navy consists of studies relating short-term exposure of bottlenose dolphins and belugas to high levels of noise to Temporary Threshold Shifts. The Navy (Dept. Navy 2008b, p 3-7) noted aggressive behavior toward the test apparatus, suggesting stress was another consequence of the test (see also Romano et al. 2004). Such effects would be unconditional results of noise exposure. However, extrapolation of the level at which aggression was observed to the level at which behaviorally mediated effects might occur in the wild is problematic, as this depends on how well trained the subjects were. For	This was specifically addressed in the Draft EIS/OEIS (Section 3.8.7.2) and considered as part of this decision making process. Additional data sets from wild animals were incorporated into development of the risk function parameters specifically to address this concern. Additionally, as discussed in Domjan 1998, and as cited in the Draft EIS/OEIS, animals in captivity can be more or less sensitive than those found in the wild. It does not follow, therefore, that the risk function modeling underestimates takes.

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		example, the Navy has been a leader in training dolphins and other marine mammals to cooperate with husbandry procedures. Tasks like taking blood, stomach lavage, endoscopic examination, collection of feces, urine, milk, semen and skin samples, etc. once required removing individuals from the water and using several people to restrain them. With training, painful and uncomfortable procedures can be accomplished without restraint and with a reduction in stress that has significantly extended lifespans of captive marine mammals (Bain1988).	
NRDC - 114	NRDC - Appendix C David Bain - 11	12. Right whales exposed to alerting devices consistently responded when received levels were above 135 dB re 1 µPa. Due to the small sample size (six individuals), it is unclear whether this is close to the 50% risk, the 100% risk level, or both. These data do not allow identification of B, as lower exposure levels were not tested. In mysticetes exposed to a variety of sounds associated with the oil industry, typically 50% exhibited responses at 120 dB re 1 µPa. Thus right whales may be similar to killer whales.	This comment contains an apparent factual inaccuracy with regard to the only citation provided for the repeated assertion that 50% of marine mammals will react to 120 db re 1uPa. Malme et al., (1983, 1984) indicated that for migrating whales, a 0.5 probability of response occurred at 170 dB.
NRDC - 115	NRDC - Appendix C David Bain - 12	*See Table 1: Bain Appendix H* Datasets not considered The Navy incorrectly concludes that additional datasets are unavailable. In addition to the other killer whale datasets mentioned above, data illustrating the use of acoustic harassment and acoustic deterrent devices on harbor porpoises illustrate exclusion from foraging habitat (Laake et al. 1997, 1998 and 1999, Olesiuk et al. 2002). Data are also available showing exclusion of killer whales from foraging habitat (Morton and Symonds 2002), although additional analysis would be required to assess received levels involved. The devices which excluded both killer whales and harbor porpoises had a source level of 195 dB re 1 ~a, a fundamental frequency of 10kHz, and were pulsed repeatedly for a period of about 2.5 seconds, followed by a period of silence of similar duration, before being repeated. Devices used only with harbor porpoises had a source level of 120-145 dB re 1 Pa, fundamental frequency of 10 kHz, a duration on the order of 300 msec, and were repeated every few seconds. Harbor porpoises, which the Navy treats as having a B+K value of 120 dB re µPa (with A large enough to yield a step function) in the AFAST DEIS (Dept. Navy	The data sources the commenter presents as needing consideration involve contexts that are not applicable to the proposed actions or the sound exposures resulting from those actions. For instance, the commenter's citation to Lusseau et al. (2006) involve disturbance over a three year period to a small pod of dolphins exposed to "8,500 boat tours per year", which is nothing like the type or frequency of action that is proposed by the Navy for the GOA EIS/ OEIS. In a similar manner, the example from noise used in drive fisheries are not applicable to Navy training. Navy training involving the use of active sonar typically involves ships that are located miles apart, the sound is intermittent, and the training does not involve surrounding the marine mammals at close proximity. Further, the commenter states that effects of sound sources from relatively continuous acoustic harassment devices and acoustic deterrent devices which are specifically designed to exclude marine mammals from habitat are analogous to MFA effects. However, continuous sound from stationary exclusion devices specifically designed to harass animals is fundamentally different from intermittent sonar mounted on fast moving ships during the short nature of the proposed actions.

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		2008a), 45 dB lower than the average value used in the HRC SDEIS, may be representative: of how the majority of cetacean species, which are shy around vessels and hence poorly known, would respond to mid-frequency sonar. Even if harbor porpoises were given equal weight with the three species used to calculate B+K, including them in the average would put the average value at 154 dB re 1 µPa instead of 165 dB re 1 µPa.	
NRDC - 116	NRDC - Appendix C David Bain - 13	14. An important property of the model is that the biologically observed basement value is different than the mathematical basement value. The Navy proposes using 120 dB re l ~Pa as the basement value. They indicate the selection of this value is because it was commonly found in noise exposure studies.	Please see response to NRDC – 112.
NRDC - 117	NRDC - Appendix C David Bain - 14	15. For example, many looked at changes in migration routes resulting from noise exposure, and found that 50% of migrating whales changed course to remain outside the 120 dB re 1 µPa contour (Malme et al. 1983, 1984). These results might be interpreted in several ways. They could be seen as minor changes in behavior, resulting in a slight increase in energy expenditure. Under this interpretation, they would not qualify as changes in a significant behavior, and are irrelevant to setting the basement value. They could be interpreted as interfering with migration, even though the whales did not stop and turn around, and hence 120 dB would make an appropriate B+K value rather than B value. Third, the change in course could have been accompanied by a stress response, in which case the received level at which the course change was initiated rather than the highest level received (120 dB re 1 µPa) could be taken as the biological basement value.	It is noted that an apparent factual inaccuracy with regard to the only citation provided for the repeated assertion that 50% of marine mammals will react to 120 db re 1uPa. Malme et al., (1983, 1984) indicated that for migrating whales, a 0.5 probability of response occurred at 170 dB.
NRDC - 118	NRDC - Appendix C David Bain - 15	*See Table 2: Bain Appendix* Take numbers are based on Alternative 3 in the Hawaii Range Complex SDEIS (Dept. Navy 2008b), which in turn is based on the No Action Alternative, Table 3.3.1-1. Where the number of takes approaches the size of the population, the actual number of takes will be smaller than shown in the table. However, individuals will be taken multiple times and the duration of takes will be longer than if the calculated number of takes were small. Presumably, longer and more frequent takes of individuals will have more impact on the population than takes due to single exposures.	The values suggested as parameters, the results of which are presented in Tables 2 and 3, are not reasonable given that the environmental conditions in GOA TMAA includes ambient noise (naturally occurring background noise) levels at or above those suggested by the commenter as behavioral harassment “B” basement values. The use of these results for examination of potential uncertainty and bias in the risk function as presented in the EIS/OEIS is, therefore, not informative or applicable in the GOA TMAA's context.

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		See Table 3: Bain Appendix H Table 3. Sensitivity analysis based on a model with spherical spreading for 2 km followed by cylindrical spreading.	
Ocean Conservation Research - 1		Dear Mrs. Burt, We have just received this week (December 20,2009) by US mail the, Gulf of Alaska Navy Training Activities draft EIS/OEIS, with the enclosure letter dated December 4 2009. I can not attest to the reason for the late delivery as the envelope was not stamped with a postmark. Nonetheless we believe that as was the case in the December 2005 issuance of the US Undersea Warfare Training Range (USWTR 70 Federal Register 62101-62103), the Gulf of Alaska Draft EIS/OEIS is far too lengthy and detailed, and far too important to have the public comment period constrained by a temporal conflict with the traditional American winter holidays. Therefore we respectfully request that the public comment period for this document be extended an additional 10 business days from Jan. 25 to Feb. 8, 2010. Extending the comment period would also be consistent with the extension given to the 2005 USWTR Draft EIS for much the same reason.	Please see AMCC-16.
Ocean Conservation Research - 2		Additionally I am concerned that the public hearings are all limited to Alaska. While the proposed range is closest to that state, in is in both Federal and International waters and thus subject to the concerns of all US Citizens, not just Alaskans. We believe that asking concerned US citizens and marine stakeholders to travel to Alaska in the dead of winter poses an undue burden on those who do not live in Alaska, so we request that at least two public hearings be hosted in the lower 48 states, preferably in California and/or Washington DC. This would assure that a broad representation of citizens and stakeholders could become informed about the proposed training range, and provide comments for the record. Thank you for your considering our request for an extension of the public comment period for the Gulf of Alaska Navy Training Activities Draft EIS/OEIS. Sincerely, Michael Stocker Director Cc: Admiral Patrick M. Walsh Commander US Pacific Fleet Department Of the Navy	Public hearing locations were determined based on the location of potential or perceived impacts to the human environment. Because of the large geographic area of the GOA ATA's, it would be an imprudent use of taxpayer funding to conduct public hearings where there are limited or no potential impacts. As such, the Navy chose locations that would enable it to contact as many people as possible; five locations for public hearings were chosen in Alaska: Anchorage, Cordova, Homer, Juneau, and Kodiak.

ID	Organization	Public Comment (Written)	Navy Response
Ocean Conservation Research - 3		Dear Mrs. Burt, We have taken the opportunity to review the Draft Environmental Impact Statement for the Gulf of Alaska Navy Training Activities (GOA-DEIS) Temporary Marine Activities Area (TMAA). While the document reflects much work and a comprehensive exploration into the possible impacts of the proposed additional uses of the GOA as required by the National Environmental Policy Act (NEPA), we believe that the GOA-OEIS leaves much to be desired if it is to be considered a guiding document for environmental stewardship~.	This comment is duly noted.
Ocean Conservation Research - 4		This observation is made in particular light of the fact that, despite our assumptions about the boundless ability of the ocean to absorb the assaults of human enterprise we are rapidly finding that the ocean is in very poor shape.	This comment is duly noted.
Ocean Conservation Research - 5		This is a consequence of reckless resource extraction (which is not under the Navy's purview) and relentless dumping and pollution (which is).	Dumping is not practiced by Navy ships. Dumping must be authorized on a case-by-case basis by the Chief of Naval Operations (CNO) N45, and is rarely requested or authorized.
Ocean Conservation Research - 6		The fact is that in many of the more extreme cases ocean environmental degradation has been a significant product of the militarization of ocean habitats. "	This comment is duly noted.
Ocean Conservation Research - 7		We are seeing that the long term accumulation of toxics and "inert" trash is causing global scale problems with impacts on all marine biota. We are seeing the gradual and slow release of chemicals bio-accumulating and bio-concentrating throughout the entire food chain - including in humans, who consume the products of the ocean at the highest tropic levels. Bio-accumulation and concentration of toxics had not been part of the models used when decisions were made to use the ocean as a chemical toilet. But now we know better. We also know that some chemicals once thought of as benign are having profound effects on biological function such as compromised reproductive health, mutation, carcinomas, and neurological damage 41 "parts per trillion" concentrations. Knowing this, it is unconscionable to continue to treat the ocean as a toxic waste dump.	As stated above, dumping is not practiced by Navy ships. Dumping must be authorized on a case-by-case basis by the Chief of Naval Operations (CNO) N45, and is rarely requested or authorized. In addition, bioaccumulation occurs where there are elevated levels of toxic compounds in the environment. The Navy's analysis shows that releases of expended materials from the Proposed Action (through leaching and direct release) would not achieve the levels of concentration in the benthic substrate and water column necessary for bioaccumulation to occur. The expended materials used in the Proposed Action are heavy objects that will sink to the bottom of the water column. Encrustation and burial in the substrate prevent leaching from expended materials, thus further avoiding bioaccumulation. Any leaching that occurs will be diluted by ocean currents in this very large and dynamic open ocean environment, the GOA. For further information on bioaccumulation, please see response to CDFU – 9.
Ocean Conservation		While many of the toxic substances in the ocean are a product of civilian dumping and unintentional runoff from	Past military practices and historical contamination sites are beyond the scope of the EIS; they are not associated with the

ID	Organization	Public Comment (Written)	Navy Response
Research - 8		terrestrial as well as marine sources, a preponderance of terrestrial Superfund sites are due to reckless military hubris. There is no indication that the Navy'has been any different in their stewardship of the sea. This is substantiated in our comments to the GOA-DEIS herein.	Proposed Action. With regard to the cumulative impacts addressed in Section 4 of the DEIS, any contamination of bottom sediments or the water column in the GOA from these sites is reflected in the current condition of the marine environment and marine resources that inhabit the GOA. In addition, the fact that the Navy is a seagoing force, and that two-thirds of the world's surface is covered by water, means that many of our environmental initiatives focus on ocean stewardship and seek opportunities to control our "ecological footprint" in relation to marine life, coastal impacts, and water quality. We have installed technology aboard our ships to keep plastics out of the ocean and safely manage our biodegradable waste stream. We are a world leader in marine mammal research, and are funding approximately $26 million annually in marine mammal-related research projects from fiscal years 2007-2009. We serve as the executive agent for the Department of Defense Coral Reef Task Force. Major ocean stewardship efforts can be seen in our comprehensive approach to managing effects on marine life for all of our training ranges and operating areas. That environmental planning documentation is being coordinated with the National Marine Fisheries Service. Furthermore, the U.S. Navy has programs in place to manage threatened and endangered species on and around our installations; safely clean up past hazardous waste sites for future reuse; explore and develop new, greener technologies for equipment design and maintenance; and recycle metal, wood and glass. Navy installations and ship's crews frequently partner with local communities on volunteer shoreline and neighborhood cleanup projects.
Ocean Conservation Research - 9		The GOA-DEIS largely concerns the addition of Anti-Submarine Warfare (ASW) activities currently not included in the existing training range and operations. As such the proposed operations will be introducing an acoustical systems component to the training range. This includes both the introduction of acoustical energy into the environment,	The Navy agrees with this comment.
Ocean Conservation Research - 10		as well as chemicals and other pollution from expendable materials, acoustical systems, and associated equipment.	Please see response AMCC 13 and AMCC 15.
Ocean Conservation Research - 11		It also includes an extra component of underwater explosives used for acoustical signals as well as for weapons ordnance.	The Navy concurs with this comment but refers to these as "at-sea explosions."

ID	Organization	Public Comment (Written)	Navy Response
Ocean Conservation Research - 12		I am limiting our comments to impacts on fish and marine mammals; and while the main focus of Ocean Conservation Research is the bioacoustic impacts of human generated noise on the marine environment, I also include our concerns for chemical pollution in the training area.	This comment is duly noted.
Ocean Conservation Research - 13		The models and assumptions used in the GOA-DEIS for chemical and toxics "mitigation" serve as a 'philosophical as well 'as a systematic model for noise pollution in as much as that while the jurisdiction and management of the training range fits within prescribed borders, acoustical energy and chemical pollutants, and their impacts to marine life and environment that would result from the proposed exercises are not so tidily constrained.	Regarding acoustical energy please see NRDC – 27. Concerning chemicals and toxins, please see AMCC –15.
Ocean Conservation Research - 14		Symptomatic of this is that while the dumping of expended materials under "Alternative 1" and Alternative 2" is not increased within US territorial waters (which are subject to NEPA and other US environmental laws), there are substantial increases of expendables dumped in non-US Territorial waters (which are not subject to US environmental laws).	As stated previously, dumping is not practiced by Navy ships. Dumping must be authorized on a case-by-case basis by the Chief of Naval Operations (CNO) N45, and is rarely requested or authorized. However, the Navy does acknowledge that there are increases of expended materials in Alternative 1 and Alternative 2 outside of non-US Territorial waters.
Ocean Conservation Research - 15		This situation clearly illustrates the effectiveness of NEPA in protecting US territorial waters, but is also shows the "avoidance relationship" that the US Navy has for NEPA and by extension other US environmental laws.	The Navy disagrees and in fact complies with all applicable environmental laws, including NEPA and its requirements.
Ocean Conservation Research - 16		The overarching problem here is that while the jurisdictional boundaries of US environmental laws are clearly defined at 12 nm from the US Coast, energy and chemical pollutants and other destructive practices in the ocean are not subject to those boundaries. Animals impacted by reckless dumping practices, marine mammal acoustical "takes," damage to fish and fisheries food-stock (and habitat)are all trans-boundary problems in the ocean. Arid just because an animal or habitat is outside of US jurisdiction, it does not mean that the damage is any less grave than damage that occurs within US territorial waters.	This comment is duly noted. Regarding acoustical energy please see response to NRDC – 27. Concerning chemicals and toxins, please see response to AMCC –15.
Ocean Conservation Research - 17		The boundaries of our Federal laws are practically established as a consequence of the likelihood of enforcement, not as an expression of diminished impacts. If the US Navy is to uphold laws which express the priorities of the American People, the impact categories outlined in the various tables and "Environmental Consequences' statements in the GOA-DEIS[1] belie the Navy's stated	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		concern to be "stewards of the sea." ..... [1] The jurisdictional distinction is made throughout the GOA-OBIS as to whether the impact standards"': and thus mitigation thresholds, adhere to NEPA (inside 12 nm) or Executive Order [EO] 12114 (outside of US Territorial waters).	
Ocean Conservation Research - 18		It is within the context of the US Navy's responsible stewardship of the ocean - along with the understanding that the ocean is in terrible shape - that I submit the following comments and concerns for the proposed activities in the Gulf of Alaska Warfare Training Range. Our overarching recommendation is the "No Action Alternative" and to not include ASW training exercises proposed in either' Alternative 1 or Alternative 2 in the Gulf of Alaska Temporary Marine Activities Area (TMAA) for the following summary reasons:	This comment is duly noted.
Ocean Conservation Research - 19		• It is becoming increasingly and shockingly clear, the ocean is in precarious shape due to continuous and expanding insults of human enterprise and adventure. This must figure into all of our deliberations and practices that compromise ocean habitat. • Of all ocean areas within US Territorial reach, the Gulf of Alaska is one of the least assaulted areas and should remain so.	The Navy agrees with this comment, is aware of the diverse biological presence in the area, and has conducted a thorough analysis of potential effects in Chapter 3 of the Draft EIS/OEIS. The Navy is confident, and the analysis indicates, that its training activities will not impact the marine environment.
Ocean Conservation Research - 20		• The US Navy has recently expanded Anti-submarine Warfare training areas in Atlantic (USWTR), the Northwest Warfare Training Range Complex. Hawaii Range Complex, and the Southern California Warfare Training Range Complex. Adding the Gulf of Alaska is not justified by any scarcity of other training areas.	To implement its Congressional mandates, the Navy needs to support and conduct current and emerging training activities in the GOA ATA's and upgrade or modernize range complex capabilities to enhance and sustain Navy training and testing. These objectives are required to provide combat capable forces ready to deploy worldwide in accordance with U.S.C. Title 10, Section 5062. The Assistant Secretary of the Navy (Installations & Environment) determines both the level and mix of training to be conducted and the range capabilities enhancements to be made within the GOA ATA's that best meet the needs of the Navy.
Ocean Conservation Research - 21		• The chemical, toxic and "inert" pollution models used in the GOA-DEIS are over simplistic and do not take into account current state of knowledge about accumulation and concentrations of chemical, toxic, and "inert" pollutant behavior throughout the entire ocean, and up and down the entire food chain - including humans.	Please see response to AMCC – 15.

ID	Organization	Public Comment (Written)	Navy Response
Ocean Conservation Research - 22		• Insufficient data provided on the sonar characteristics and source levels so a complete assessment of the potential impacts presented in the DEIS are incomplete.	Proposed sonar use in the TMAA is listed in Section 2.5.2.1.
Ocean Conservation Research - 23		• The bio-acoustic impact models used in the GOA-DEIS are over-simplistic and do not represent wild animal impacts or behaviors and do not account for the agonistic qualities and characteristics of the various signals that would be introduced into the environment.	Please see response to NRDC – 27.
Ocean Conservation Research - 24		• Mid and high frequency sonar acoustic impact data of fish is lacking and does not justify the DEIS conclusion that impacts are "negligible or non-existent."	While the effects of sound on all species of fish have not been studied leaving much unknown, there are reasonable extrapolations that can be made based on the general anatomy of fish and from the representative species that have been studied. Based on those studies and as detailed in Section 3.6, it is unlikely that sonar will adversely affect most fish given most fish cannot hear in the frequency range of the mid and high frequency sonar Navy is proposing to use. In addition, Navy has been conducting these same training activities in locations such as Southern California and the East Coast for many decades and both of which support healthy and diverse fisheries. Additionally, please see response to NRDC – 27.
Ocean Conservation Research - 25		• The mortality "risk continuum" for fish due to explosives is inadequate and suspiciously biased to appear much more benign than it is.	This comment is duly noted.
Ocean Conservation Research - 26		• The conclusion in the DEIS section on fish admits that very little is known about the impacts of sonar on fish - which contradicts the summary table statement that "sonar used in Navy exercises would result in minimal harm to fish or EFH."	See comment response to Ocean Conservation Research – 24.
Ocean Conservation Research - 27		• The exposure risk models of marine mammals appear to contain many examples of "statistical manipulations of convenience" which erodes both the credibility of the models and the integrity of the entire GOA-DEIS.	This comment is duly noted. Please see response to NRDC – 27.
Ocean Conservation Research - 28		• The model of bioacoustic impact of explosives on marine mammals is over simplistic. It models the animals as "linear input devices" and does not account for synergistic effects of stress on the animal or the destruction of habitat and food sources.	The criteria described in Section 3.8 involving explosives and marine mammals was developed in cooperation with National Marine Fisheries Service (NMFS) and has been used extensively for years by NMFS for all activities involving these types of impacts in the water; for examples see [http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications]. Additionally, please see response to NRDC – 27.

ID	Organization	Public Comment (Written)	Navy Response
Ocean Conservation Research - 29		• The issuance of the DEIS over the winter holidays - truncating the available comment period is cause for suspicions that the Navy is disingenuous about seeking public input on this cumbersome, comprehensive, but nonetheless inadequate document. This established a justifiable foundation of mistrust as we evaluated the document. We have substantiated these assertions below. Given the limited time that was available for review we had to focus on the more obvious concerns. If we actually had the full 45 days required by NEPA not interrupted by holidays and obligatory year-end activities our comments would be much more comprehensive and infonnative. Nonetheless we were able to provide the forgoing, which more than adequately substantiates our recommendation that the "No Action Alterative;' is the preferred alternative for the GOA-DEIS.	Please see response to AMCC– 16.
Ocean Conservation Research - 30		**"Expended Materials"** While Ocean Conservation Research is focused on understanding and finding solutions to the impacts of human generated noise on marine life, we are compelled to Comment on the chemical, toxics, and "inert" pollution from expended materials in the proposed DEIS. This is because, as indicated above, this dumping of chemicals in the ocean needs to be curtailed. The US Navy's continued disregard for the mounting biological evidence that chemicals are seriously impacting the global ocean is indicative of a larger hubris that plagues the entire GOA-DEIS.	Please see response to AMCC – 15. Additionally, please note that dumping is not practiced by Navy ships.
Ocean Conservation Research - 31		This hubris is characteristically represented in the following comment from the Executive Summary section Table ES 3.1: "Outside of U.S. territory, air pollutant emissions would increase substantially, mainly from increased surface vessel and aircraft activities. • SINKEX would generate a substantial portion of the air pollutants that would be emitted under Alternative 2. • Although Alternative 2 would increase emissions of air pollutants over the No Action Alternative, emissions outside of U.S. territorial seas would not cause an air quality standard to be exceeded." Believing that air pollution (in this case) or marine pollution respects US Territorial boundaries is particularly short sighted in light of what we know about air and ocean circulation patterns; especially in the GOA and arctic waters.	Regarding air quality, please see response to NRDC–100. Additionally, please see response to AMCC – 15.

ID	Organization	Public Comment (Written)	Navy Response
		Also in Table ES-3: Summary of Effects: "Expended materials under Alternative 1 would not have a substantial effect on the marine environment." The phrase "substantial effect" needs to be more dearly defined, because the numbers and weights of materials expended annually (under preferred Alternative 2) provided in Table 3.2-18 and Table 3.2-19 indicate 10,000 lbs. of hazardous materials per year. Without even evaluating the toxicity of the specific materials, 10,000 lbs. per year is not insignificant.	
Ocean Conservation Research - 32		Our current state of knowledge about the impacts of hazardous substances on marine life, and the effects of bio-concentration as hazardous materials move up the trophic levels do not constitute an inconsequential impact. Hazardous materials are not static; they are hazardous because they are dynamic. And just because a deposit of hazardous materials might be statistically hard to detect, we can assume that over time the accumulation of these materials in the environment will have negative impacts on marine life.	Please see above response to comment.
Ocean Conservation Research - 33		Additionally, framing the hazard in longtime frames does not decrease the impacts. For example on page 3.2-12 we find "In instances where seawater corrodes the sonobuoy, that corrosion takes at least 40 years." What will happen after 40 years? Will the ocean be somehow immune to the effects? And on page 3.2-23 "Most of these materials are relatively inert in the marine environment, and will degrade slowly." What does "relatively inert" mean? Throughout the "Expended Materials" section we find the repeated use of the phrase "quickly dispersed by (or diluted by) ocean and tidal currents" troubling.	Please see response to AMCC – 15.
Ocean Conservation Research - 34		It seems that the US Navy assumption is that once dispersed outside of the training range that the substances are no longer a problem. But we have found that chaff, plastics, and drifting chemical pollutants are a significant and growing global environmental problem because ocean currents end up pulling them into oceanic gyres where they end up in dangerous concentrations, polluting the food supply from the lowest tropic levels on up. While much of this has been accidental or incidental to global consumption, the US Navy deliberately adding to this mess - particularly with known military toxins is unconscionable.	Please see response to Roberta Highland & Robert Archibold – 2.

ID	Organization	Public Comment (Written)	Navy Response
Ocean Conservation Research - 35		**Acoustic Impacts** While we know that the ocean is largely an acoustic environment, the understanding about role of acoustics across the vast array of marine animals is rudimentary at best. In some cases we have not been able to procure evidence that our noises have any impact at all, and in other cases we are baffled by the extreme impacts that human generated noise has wrought on marine life.	This comment is duly noted.
Ocean Conservation Research - 36		As we roll back the frontiers of our ignorance it will be wise to assume precaution. This would mandate that we gather as much evidence as possible and populate our models with the most accurate, concise, and up-to-date data as possible.	This comment is duly noted. Additionally, please see response to NRDC – 27.
Ocean Conservation Research - 37		We are concerned about the impacts of the noise generated in the training range on marine animals both inside and outside of the training range. This includes impacts on migratory and resident marine mammals as well as migratory and resident fish particularly fish with a high commercial value, including but not limited to salmon, halibut, herring, haddock, Pollack, and crab, the consequent impacts on the commercial fishery, and the consequent impacts on links in the regional food chain.	Please see response to AMCC – 2.
Ocean Conservation Research - 38		Noises of concern are the noises from explosive ordinance, mid-frequency sonar, sonar jamming signals, communication and surveillance sonar, and mechanical noises associated with warfare exercises such as engine noise, propeller cavitation, and through hull transmitted mechanical noise.	Please see response to AMCC – 2.
Ocean Conservation Research - 39		One of our dominant systematic concerns expressed throughout this document is that a preponderance of audiometrics for fish and marine mammals are derived from laboratory test signals that have very little correlation to the exposure signals of concern particularly the various acoustic communication and sonar signals.	Please see response to Greg Brown – 3.
Ocean Conservation Research - 40		This situation is exacerbated by the presentation of sonar systems in the DEIS Appendix H "Acoustic Systems Descriptions" section wherein the various acoustic systems were generally described and qualified in terms of their frequency bands (Low, Mid, and High frequency) but source levels were not provided, and in most cases there was no indication of signal qualities (e.g.: short "pings" or longer data-streams). Both exposure levels and signal qualities have bearing on the biological impacts so a complete	The information listed as classified (such as source levels) is not often releasable to the public and where this is the case it has been indicated in the DEIS.

ID	Organization	Public Comment (Written)	Navy Response
		assessment of the potential impacts presented in the DEIS are incomplete.	
Ocean Conservation Research - 41		This is also the case with the Portable Undersea Training Range (PUTR) (section H.1.9) in terms of transponder frequencies, source levels, and signal characteristics.	The information provided in the DEIS quantifies acoustically modeled impacts using the parameters of the actual systems. It is not necessary to know the often classified details of these systems since the modeled putout of those systems has been provided.
Ocean Conservation Research - 42		Without knowing more about the signal characteristics of these devices it, is impossible to derive and accurate impact model to determine how different these signals are from the audiometric signals used to establish auditory thresholds in subject animals, or determine if there are acoustical characteristics of these signals that may be of greater concern than just their amplitude.	This comment is duly noted. Please see above regarding classified data.
Ocean Conservation Research - 43		Seminal to this discussion is the assumption that all hearing animals have a need to discriminate pitch. While mammals, including marine mammals, have organs of pitch discrimination (the cochlea) it is not clear that any other animal family has a need to discriminate pitch. It is likely that other animals have acoustical perceptions tailored to their specific habitat priorities that do not include pitch discrimination.	As described in Section 3.8, the criteria for determination of potential impacts on marine mammals was developed using the best available science and in cooperation with National Marine Fisheries Service scientists and biologists.
Ocean Conservation Research - 44		Almost without exception, all audiograms taken of marine animals are a comparison of frequency and amplitude sensitivities. It is possible that in lieu of pitch and level perceptions, that many fish (or other marine animals) could be sensitive to other characteristics of acoustical energy; that in place of level or time-of arrival differences between sound receptors, these animals can distinguish phase differences between 'particle' and 'pressure gradient' acoustical energy. In this context, time-domain cues across these physical characteristics of acoustical energy are much more important than frequency or amplitude cues.	Please see comment response to OCR – 43 above.
Ocean Conservation Research - 45		This could cut both ways in regards to the acceptable noise levels for fish in the subject environment: Up to the point where the acoustical mechanics of the noise in the environment and the acoustical compliance of the organism are in conflict with the noise levels, a particular fish may not even perceive the noise. This would explain why fish residing in extremely turbulent settings (like corvina or surf perch) can endure extreme, noise-saturated acoustical settings and still respond to subtle acoustical stimulus in	See section 3.6 for a discussion of fish hearing.

ID	Organization	Public Comment (Written)	Navy Response
		their environment[2]. This could mean that very loud but distant noise sources might have much less impact on an animal than quieter but closer noises. ..... [2] J. Engelmann, W. Hi1J1ke, J. Mogdans & H. Bleckmann "Neurobiology: Hydrodynamic stimuli and the fish lateral line" 2000 Nature 408, p.51-52 .	
Ocean Conservation Research - 46		This is germane to the DEIS because the preponderance of audiograms and threshold shift procedures used to determine the acoustical sensitivities of fish in the cited studies[3] used either sinusoidal signals or band limited 'pink' noise[4]. While this statement doesn't answer many questions in regard to the impacts of the noise generated by the proposed TMAA project on various fish exposed to the noises of the program, it highlights the fact that the assumptions used to frame the impact models do not reflect the actual acoustical situation proposed in the program. This is particularly evident in the fact that some of the proposed acoustical signals will not be sinusoidal, rather some signals will include fast rise times and high "crest factors"[5] which are significantly different from sinusoidal signals. ..... [3] The GOA-DEIS cites Scholik and Van. 2002 and Wysocki and Ladich, 2005. These studies also evaluate three fresh water species: The goldfish (Carassius auratus) and the Rafael catfish Platydoras costatus) both live in still, turbid waters, (thus their particular acoustical adaptations), and the sunfish (Lepomis gibbosus), a clear water inhabitant. These animals are not good models for open ocean fish that live in a completely different acoustic habitat. [4] Band limited "Pink Noise" is typically derived from Fourier Transfer derived Gaussian noise constructed from sme waves without any coherent time-domain component. [5] Crest factor is the ration of peak to RMS value of a signal. Pure sinusoidal waves have a crest factor of .707; pure "square waves have a crest factor of 1; repetitive impulse sounds have a crest factor greater than 1.	See section 3.6 for a discussion of fish hearing.
Ocean Conservation Research - 47		This shortcoming can only be addressed by doing systematic testing on various fish using signals and levels that more closely match the signals proposed for the TMAA, especially the mid frequency communication sonars that overlap the known audiological response of the subject fish and contain either rich harmonic 'content, fast rise times, and crest factors at or above unity.	See section 3.6 for a discussion of fish hearing.

ID	Organization	Public Comment (Written)	Navy Response
Ocean Conservation Research - 48		Using the actual sonar signals to determine acoustical thresholds would also clarify the impacts of the proposed signals on other marine biota, where again the preponderance of audiological or physiological impact data are taken from sinusoidal or 'pink noise' sources.	This comment is duly noted.
Ocean Conservation Research - 49		Marine invertebrates have mechanoreceptors that are adapted to the sinusoidal motions of their environment. Sometimes these motions are relatively energetic (such as the acoustical energy generated by heavy currents and wave motions), so these animals may not be as affected by extreme sinusoidal energy. On the other hand, fast rise times or high crest factors used iIi some acoustical communication signals may exceed the acoustical compliance of the organism and damage it. These types of signals need to be explored with various marine invertebrates and plankton prior to excluding all of these animals from consideration of acoustic impacts in the GOA-DEIS.	The Navy conducted a thorough analysis of marine invertebrates in the Draft EIS/OEIS, using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. The effects of underwater explosions on invertebrates are described in Section 3.5, Marine Plants and Invertebrates. Most expended materials are inert and dense and readily sink deep into existing sediments or become covered with sediment over time. These materials would also become encrusted by chemical processes or by marine organisms that further isolates them from the environment. Once deposited, the materials would not pose a hazard to benthic communities. Because high quality habitat occupies only a small portion of the benthic environment, there is a small potential for the communities to be affected by initial impact of expended materials. However, localized impacts to bottom-dwelling organisms could occur if struck but population level effects are not anticipated.
Ocean Conservation Research - 50		**Acoustic Impacts: Fish** In chapter 3.6 on fish, and most notably under section 3.6.2.2 Assessment Framework it is stated repeatedly that there are many data gaps in the literature on the impacts of noise on fish. The remark that "it is hard to extrapolate between species or conditions" is abundantly found throughout this section, substantiating the general position that there is a high level of uncertainty in the known impacts of noise on fish.	This comment is duly noted.
Ocean Conservation Research - 51		But the absence of data does not mean the absence of harm, and precautionary practices would dictate that some known statistical mean of harm would be used to set mitigation thresholds. What is done throughout this section ambiguates the probable impacts with biased metrics. For example the correlation of impulse impact mortality relative to body mass and charge size taken from Young's equations[6] were extrapolated into tables 3.6-4: "Range of Effects for at-Sea Explosions" and table 3.6-5: "Estimated	This supposition, however, does not change the conclusion that there may be injury or mortality to individual fish but the proposed actions would not result in impacts to fish populations in the Gulf of Alaska.

ID	Organization	Public Comment (Written)	Navy Response
		Fish-Effects Ranges for Explosive Bombs" to indicate the distance at which I0% mortality would occur (also noted as "90% survival" in the DEIS.)[7]. This metric ambiguates the perspective that fish at or outside of the specified range have a 10% or greater survival rate. There is a mortality continuum from 10% - 100% mortality inside that range. So while for example only 10% of the fish greater than 30 lbs will be killed at 578 feet by a 500 lb. bomb, it is highly likely that the death rate will be significantly higher for smaller fish with the mortality continuum scaling down to only 10% at 1289 feet and beyond. ..... [6] Young, G.A.. 1991. Concise methods for predicting the effects of underwater explosions on marine life. Naval Surface Warfare Center, Dahlgren, Virginia. [7] GOA-DEIS 3.6-31	
Ocean Conservation Research - 52		The Young paper also only states short term or instant mortality. It does not evaluate intermediate and long tern damage to the animals and their biological function that will kill them within days or weeks from the assault.[8] ..... [8] McCauley et al., High Intensity Anthropogenic Sound Damages Fish Ears, J. Acoust. Soc. Am. 113 (2003).	Please see response to OCR – 51 above.
Ocean Conservation Research - 53		The type of explosive is also not integrated into the metric. Rise times of explosives have a significant bearing on mortality.[9] Different explosives have varying impulse rise times [IO] so without knowing what was used in the literature and what explosives are proposed in the GOA-DEIS this entire section along with the extrapolated metrics are meaningless. ..... [9] Stocker, M "Examination and evaluation of the effects offast rise-time signals on aquatic animals" J. Acoust. Soc. Am. 120,3267 (2006) [10] Fry, Donald H 1953 "Observations on the effect ofblack powder explosions on fish life." Calif, Fish and Game v.39:2	This comment is duly noted.
Ocean Conservation Research - 54		The conclusion on the impacts of sonar on fish found in the DEIS on page 3.6-43 tidily sums it up: "the effects of sound on fish are largely unknown...There is a dearth -of empirical information on the effects of exposure to sound, let alone sonar, for the vast majority of fish."	This comment is duly noted.
Ocean Conservation		Given this admission (strengthened by the remaining text in the paragraph), the conclusion in table 3.6.10 "Because only	While the effects of sound on all species of fish have not been studied leaving much unknown, there are reasonable

ID	Organization	Public Comment (Written)	Navy Response
Research - 55		a few species of fish may be able to hear the relatively higher frequencies of mid-frequency sonar, sonar used in Navy exercises would result in minimal harm to fish or EFH" contradicts the conclusion that 'we know nothing.' Either we know nothing, or we know that no harm will come from sonar exposure. Not both. Given that "we know nothing" supersedes the assumption that no harm will come from exposure, the former statement prevails. We also do know that there are many fish that do hear well in the ranges covered by Mid frequency and High frequency sonar[11] although currently there are no published exposure tests on these animals using MF and HF sonars. The auditory bandwidth sensitivity of these fish was .probably a consequence of evolutionary pressure to hear the sounds of their main predators, the odontocetes -- indicating that other odontocete prey may as well perceive and thus be impacted by Mid or High Frequency sonars. ..... [11] Mann, D.A., D.M. Higgs, W.N. Tavolga, M.J. Souza, and A.N. Popper. 2001. "Ultrasound detection by clupeiform fishes." The Journal of the Acoustical Society of America 109: 3048-3054.	extrapolations that can be made based on the general anatomy of fish and from the representative species that have been studied. Based on those studies and as detailed in Section 3.6, it is unlikely that sonar will adversely affect most fish given most fish cannot hear in the frequency range of the mid and high frequency sonar Navy is proposing to use. In addition, Navy has been conducting these same training activities in locations such as Southern California and the East Coast for many decades and both of which support healthy and diverse fisheries.
Ocean Conservation Research - 56		An important element of certainty is missing from our understanding of fish responses to MF and HF sonar signals. The Popper 2008[12] report frequently cited in the DEIS refers to contract studies on the impacts of MF and HF sonars on fish, but the paper is only used to cite known and published data about fish hearing. The impact data is not cited and the paper is a US Navy contract paper and has not been published in peer reviewed journals. ..... [12] Popper, A.N. 2008. Effects of Mid- and High-Frequency Sonars on Fish. Naval Undersea Warfare Center Division. Newport, Rhode Island. Contract N66604-07M-6056	This comment is duly noted.
Ocean Conservation Research - 57		So what we are left with is data derived from audiograms taken of marine animals are a comparison of frequency and amplitude sensitivities using sinusoidal derived signals [13]. It is possible that in lieu of pitch and level perceptions, that many fish (or other marine animals) could be sensitive to other characteristics of acoustical energy; that in place of level or time-of arrival differences between sound receptors, these animals can distinguish phase differences between 'particle' and 'pressure gradient' acoustical energy. In this context, time-domain cues across these physical	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		characteristics of acoustical energy are much more important than frequency or amplitude cues. ..... [13] Most audiograms either use single frequency sinusoid signals or band limited "Pink Noise" which is typically derived from Fomier Transfer derived Gaussian noise constructed from sine waves without any coherent time...domain component. These signals are very unlike mid-frequency sonar signals.	
Ocean Conservation Research - 58		While this statement doesn't answer many questions in regard to the impacts of the noise generated by the proposed GOA training range operations on various fish exposed to the noises of the operations, it highlights the fact along with the "dearth of empirical information on the effects of exposure to sound, let alone sonar,,,[14] that fish will be exposed to signals for which we have even less data and will include signals with fast rise , ' times and high "crest factors"[15] which are significantly different from sinusoidal signals. ..... [14] GOA-DEIS 3.6-43 [15] Crest factor is the ration of peak to RMS value of a signal. Pure sinusoidal waves have a crest factor of .707; pure "square waves have a crest factor of 1; repetitive impulse sounds have a crest metor greater than 1.	This comment is duly noted.
Ocean Conservation Research - 59		This shortcoming can only be addressed by doing systematic testing on various fish using signals and levels that more closely match the signals currently being used or developed for modem ASW operations, especially the mid frequency communication sonars that overlap the known audiological response of the subject fish and contain either rich harmonic content, fast rise times, and crest factors at or above unity. Using the actual sonar signals to determine acoustical thresholds would also clarify the impacts of the proposed signals on other marine biota, where again the preponderance of audiological or physiological impact data are taken from sinusoidal or 'pink noise' sources. Marine invertebrates have mechanoreceptors that are adapted to the sinusoidal motions of their environment. Sometimes these motions are relatively energetic (such as the acoustical energy generated by heavy currents and wave motions), so these animals may not be as affected by extreme sinusoidal energy. On the other hand, fast rise times or high crest factors used in some acoustical	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		communication signals may exceed the "acoustical compliance of the organism and damage it. These types of signals need to be explored with various marine invertebrates and plankton prior to concluding that they are not impacted by loud, fast rise-time, high crest-factor sonar signals. But in the absence of evidence clearly indicating harm, the GOA-DEIS takes the "let's see if anything floats up to the surface" approach - which has left our ocean in such bad shape already.	
Ocean Conservation Research - 60		**Acoustic Impacts: Marine Mammals** While the modeling of the impacts of acoustical exposure in section 3.8.7.2 "Acoustic Effects: Assessing Marine Mammal Responses to Sound" is extensive, detailed, and comprehensive, given the other quirky statistical models found throughout the entire GOS-DEIS (and the predictable history of biased mathematical and statistical models in prior Navy DEIS ,documents), frankly I worry when the Navy's statistical modelers are given so much text space to synthesize decades of scientific study into their own home-spun complex risk-continuum. Symptoms of this are ambiguously presented in the opening gambit on Table 3.8-1[16] wherein the density of given species of concern are presented in a density metric of animals per km^2. While I understand the statistical value of having a distribution number that represents the probability of interactions within a prescribed dataset, the fact of the matter is that there is no such thing as ".0019" of a Humpback whale, or even a ".I 892 oaf DaII's porpoise." And once the statistical arguments get to this point they are in their third derivation which indicates that they are being set up for a statistical model of convenience. ..... [16] GOA~DEIS section 3.8-2 through 4.	This comment is duly noted.
Ocean Conservation Research - 61		While we did review the models that use these metrics in Appendix D and at face value they appear to be based on reasonable assumptions, given some of the other biased and quirky models used in the Fish Impacts section we would need to run these models in a few scenarios to assure that they do yield cogent and credible results. For example the setting the cutoff extent of the integral to 120dB seems to be based on either excluding the harbor porpoise form the marine mammal response data set or modifying the	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		harbor porpoise risk function to a "heaviside step function"[17] smells suspiciously like manipulations of statistical convenience. Unfortunately given the truncated comment period on the GOA-DEIS due to the issuance of this over the traditional winter holidays we did not have as much time as would be required to review the entire architecture of the US Navy statistical arguments justifying their particular models. Suffice it to say that in addition to the forgoing comments, we suspect that there are clever manipulations afoot. Of course none of these characterizations require a response under NEPA, but the following criticisms substantiate these claims. ..... [17] GOA-OEIS Appendix 0-31, also Section 3.8-101	
Ocean Conservation Research - 62		There are many questionable assumptions made in the GOA-DEIS regarding the actual levels of Temporary Threshold Shift (TTS) and Permanent Threshold Shift (PTS) in marine mammals. As inferred in the DEIS, PTS levels are on marine mammals are derived numerically and not actually known. This is because we have not intentionally subjected marine mammals to PTS levels (for compassionate reasons). I will review the PTS assumptions below, but the foundation of the PTS assumptions used in the DEIS are made from data derived from TTS studies. Furthermore, these studies have all been done on test-habituated animals, and in many cases these animals are quite old. Additionally, these studies include a level of assumptions that belie the actual data. For example a study featured in the GOA-DEIS by Finneran, Carder etal. (JASA 2005)[18] used mature (18-20 years) or old (38 - 40 years) animals that have been systematically exposed to noise studies for many years. The subjects have lived in a busy environment full of anthropogenic noise, so it is highly likely that they have been habituated to the test environment. It is clear that these animals do not represent different species of wild marine animals across a broader - and mostly younger - age range, in their own environment. ..... [18] James Finneran, Donald Carder, Carolyn Schlundt, Sam Ridgeway "Temporary threshold shift in bottlenose dolphins (Tursiops Truncatus) exposed to mid frequency tones." October 2005 J. Acoust. Soc. Am. 118(4) p.2696	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
Ocean Conservation Research - 63		Model inaccuracies due to habituation in the instance of this study is compounded by the fact that the test animals may employ biological protections to prepare them for their tests-protections akin to the "wincing" that visual animals use to protect their eyes from damage. Terrestrial animals have a mechanism, like "wincing" in their middle ears that protect them from damaging sounds. This mechanism is a tightening of the tensor tympani muscles around the middle ear ossicles, protecting the hearing organ from physical damage.[19] While this mechanism is fast acting in response to "surprise" stimulus, once terrestrial animals are habituated to expect loud noise, the system is activated by the expectation. In humans the mechanism kicks in when noise levels reach 75dB SL (re: 20~a) - about 10dB SL below where OSHA guidelines for TIS-level noise exposures occur in humans, and about 50dB SL below where PTS occurs. ..... [19] Pierre Buser and Michel Imbert "Audition" 1992. MIT Press. p. 110 - 112.	This comment is duly noted.
Ocean Conservation Research - 64		The middle ear structure of marine mammals differs significantly from the middle ears of terrestrial animals. We are just learning about how environmental sounds are conveyed into the odontocete's inner ears. This mechanism seems to include the lipid channels in their lower jaws, [20] and the mobility of the bulla (the bone envelope that houses the cochlea and semicircular canals). While this mechanism does include the same middle ear ossicles of terrestrial mammals, these bones in cetaceans can be rigidly attached to each other and connected differently (by way of ligaments) to the tympanic membrane.[21] While the ears of the odontocetes or mysticetes do not have the same tensor tympani found in terrestrial mammals, it is probable that these hearing specialist animals would have an analogous system to protect their inner ears from periodic or occasional sound levels that would otherwise damage their organs of hearing.[22] If this assumption is correct, then the "sound test" habituated dolphins would obviously yield much higher thresholds for TTS than their wild, un-habituated counterparts - given that they will always "prepare" for acoustical assaults when asked to perform in a given testing situation.	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		[20] Heather Koopman, Suzanne Budge, Darlene Kettell, Sara Iverson "The Influence of Phylogeny, Ontogeny and Topography on the Lipid Composition of the Mandibular Fats of Toothed Whales: Implications for Hearing" 2003 Paper delivered at the EnVironmental Consequences of Underwater Sound conference, May 2003. [21] G.N. Solntseva, "The auditory organ ofmammals"1995 p. 455 in "Sensory Systems ofAquatic Mammals' R.A. Kastelein, J.A. Thomas and P.E. Nachtigall eds. De Spit press. [22] This system might involve thetilio-regulating the viscosity, and thus the acoustical compliance of the lipids through regulating blood circulation around the organs - thereby attenuating or accentuating acoustical transfer through the organ as needed.	
Ocean Conservation Research - 65		But even assuming that the legacy of TTS testing done on these test-habituated animals does accurately reflect the TIS levels for all wild, un-habituated animals, the data used to establish an "appropriate" TTS levels all show onset of TTS occurring between 185dB and 190dB (re: I~Pa2-s). In the DEIS these levels are presented on a chart that includes three different signal types;[23] impulsive signals representing distant explosions,[24] seismic airguns,[25] and tone bursts.[26] ..... [23] Not from Nachtigall et. Al. 2004 as stated in the DEIS. Additionally Chart 3.8.7 is mislabels "Existing TTS Data for Cetaceans when is should be labeled "Some TTS Data for Cetaceans." Many other peer reviewed TTS models exists that are not represented in the chart. [24] Finneran, J.J., C.E. Schlundt, D.A. Carder, J.A. Clark, J.A. Young, J.B. Gaspin, and S.H. Ridgway. 2000. Auditory and behavioral responses of bottlenose dolphins (Tursiops truncatus) and a beluga whale (Delphinapterus leucas) to impulsive sounds resembling distant signatures of underwater explosions. Journal of the Acoustical Society of America. 108:417-431. [25] Finneran, J.1., R. Dear, D.A. Carder, and S.H. Ridgwai 2002. Temporary shift in masked hearing thresholds in odontocetes after exposure to single underwater impulses from a seismic watergun. Journal of the Acoustical So~iety of America. 111:2929-2940. [26] Schlundt, C.E., J.J. Finneran. D.A. Carder, and S.H. Ridgway. 2000. Temporary shift in masked hearing thresholds of bottlenose dolphins, Tursiops truncatus, and white whales, Delphinapterolls leucas, after exposure to intense tones. Journal of the Acoustical Society of America, 107:3496-3508.	This comment is duly noted.
Ocean Conservation Research - 66		This disparity in signal types is noted in the text, but with the exception of two cases of TTS as a consequence of seismic signals (one at 185dB re: 1~Pa2-s and the other at 190dB)	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		the chart represents TTS as a consequence of pure tone bursts. (It was in this Schlunt eLal. study that the test-habituated beluga whale subject attacked the testing apparatus before the tests were complete). You might say that this illustrates that there is a physiological as well as a behavioral difference in impacts between the various signals rather than the conclusion that there is a clear threshold at 195dB as indicated in the DEIS.	
Ocean Conservation Research - 67		Nonetheless the chart takes a "statistical mean" to justify raising the TTS level to 195dB.[27] This elevated level is justified in part by the statement: "Use of the minimum value would overestimate the amount of incidental harassment because many animals commented would not have experienced onset TTS"[28] This highlights one of my concerns; why do harassed animals need to experience onset of TTS? While it may be important to find the absolute value for onset of TTS in our model animal, the purpose here is to avoid harassing animals, not derive "statistical precision" on the exposure levels that will always produce TTS in test-habituated animals. For this reason the data should be used as found and as presented; that onset of TTS occurs in test-habituated animals at 185dB (re: 1l!Pa2-s). ..... [27] GOJ\-DE~S Section 3.8-87 [28] GOA-DEIS Section 3.8-92	This comment is duly noted.
Ocean Conservation Research - 68		The statement in the DEIS that "The growth and recovery of TTS are analogous to those in land mammals. This means that, ~ in land mammals, cetacean [TTS] depend on the amplitude, duration, frequency content, and temporal pattern of the sound exposure"[29] is correct, but the DEIS-adapted assumptions used in the following bullet points in this section to build the argument omit the critical characteristics of"frequency content, and temporal pattern," ignoring the evidence that signal characteristics have a stronger bearing.on TTS thresholds than amplitude.[30] ..... [29] GOA-DEIS Section 3.8-87 [30] Roger P. Hamemikand Wei Qiu "Energy-independent factors influencing noise-induced hearing loss in the chinchilla model" J. Acoust. Soc. Am. 110 (6), December 2001 .	This comment is duly noted.
Ocean Conservation		So the fundamental argument here is that as in the fish studies, none of the tests performed on marine mammals	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
Research - 69		used to substantiate the Navy's impact and mitigation models used signals that simulated the actual sonar signals proposed in the GOA ASW activities.	
Ocean Conservation Research - 70		Most papers cited for the DEIS used either sinusoidal tones or impulse noises. These signals do not elicit the same behavioral responses as more complex signals.[31] The test subjects of most papers cited for the DEIS were also older (over 30 years old), test-habituated animals that have been in captivity and used as test subjects for a large portion of their lives.[32] The captive animals are accustomed to coming into a test area for their livelihood and while they provide TTS data for their specific physiology, they are poor stand-ins for a majority of marine mammals that will be impacted by the GOA proposal. [31] R.A. Kastelien, D. Goodson, L. Lein, and D. de Haan. "TIte effects of acoustic alarms on Harbor Porpoise (Phocenaphocena)" 1997 P.367-383 mA.J. Read, P.R. Wiepkema, and P.E. Nachigall eds. "The Biology of Harbor Porpoise" de Spil publishers, Woemed, The Netherlands. [32] e.g. J. J. Finneran, C. E. Schlundt, D. A. Carder, J. A. Clark, J. A. Young, J. B. Gaspin, S. H. Ridgway Auditory and behavioral responses of bottlenose dolphins (Tursiops truncatus) and a beluga whale (De/phinapterus /eucas) to impulsive sounds resembling distant signatures of underwater explosions. J. Acoustical Soc. of America. V.108(I) July 2000.	This comment is duly noted.
Ocean Conservation Research - 71		In terms of the range of impact relative to signal amplitude, Kastelein and Rippe studied younger animals (harbor porpoise Phocena phocena) [33] with more appropriate test signals yielded significantly different results than the assumptions made in the GOA-DEIS. These animals demonstrated an aversion to more complex signals in the frequency range of the proposed sonars and at 130dB re: If.I.Pa@lm. (Animals used in this study were recently taken into captivity and approximately 3 years old.) [33] R.A, Kastelien, H.T. Rippe" The Effects of Acoustical Alarms on the Behavior of Harbor Porpoises ~phocena phocena) in a floating pen" Marine Mammal Science. 16(1) p. 46 -64. January 2000 . W.C. Verboom and R.A. Kastelem. "Some examples ofmanne mammal 'dIscomfort thresholds' in relation to man-made noise." June 22, 2005. Proceedings from the 2005 Undersea Defense Tecluiology conference 2005, Sponsored by TNO, P.O. Box 96864, 2509 JG The Hague, The Netherlands.	This comment is duly noted.
Ocean Conservation		While the signals used in this study were specifically designed to repel net-predatory marine mammals, the	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
Research - 72		signals are closer in form to many communication sonars than to the sinusoidal waves or band limited pink noise used in the DEIS citations. Another study by Verboom and Kastelein indicates that more complex signals induce a discomfort threshold level for younger, less habituated marine mammals (P. phocena and harbor seal Phoca vitulina) at or below 133dB re:lf.l.Pa@lm'.[34] [34] This study extrapolates a TTS level for these animals at 150 dB(w) re: 1J.lPa@lm.for the harbor seal, and 137dB(w) re: 1f.l.Pa@lm for the harbor porpoise. The paper also goes on to suggest that hearing injury - PTS, will occur in the Harbor seal and Harbor porpoise at 190dB and 180dB respectively - 50% to 500% less energy than the 195dB level that the GOA-DEIS presents as the thresholds for MMPA Level B harassment.	
Ocean Conservation Research - 73		Like the estimated PTS levels used in the DEIS, the TIS figures from the Verboom and Kastelein (2005) study are extrapolations - extrapolating from behavioral responses to noise exposure of young, healthy marine mammals against known human auditory responses. The disparity between the·TTS figures used by Verboom and Kastelein and the numbers used in the DEIS indicate a high degree of scientific uncertainty in the models and extrapolation methods used in both sets ofassumptions. I am more inclined to accept the Verboom Kastelein numbers for three reasons:. 1) they were not cited or crafted under the rubric of justifying a proposed program; 2) their studies were not funded by an agency whose desired actions would be limited by more precautionary results,[35] and 3) they are inherently more precautionary, in that they examine the thresholds of behavioral response, not the upper limits of physiological response. [35] Hal Whitehead and Linda Weilgart "Science and the management of underwater noise: Information gaps and polluter power." J. Acoust. Soc. Am., Vol. 110, No.5, Pt. 2, November 2001 142nd Meeting: Acoustical Society of America.	This comment is duly noted.
Ocean Conservation Research - 74		Regarding the estimation of PTS onset relative to TTS levels used in the DEIS,[36] I find these data troubling as well. The linear regressions adapted from the W.O. Ward et al papers[37] cited in the DEIS were all taken from human subjects - highly visually adapted terrestrial mammals. Ward's research indicates a threshold of PTS by examining the maximum recoverable TTS in human and finds that humans can recover from a TTS of 50dB without permanently damaging their hearing. The Ward studies are	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		"conservatively" tempered in the OEIS by incorporating a study of cats by Miller[38] that indicates that cat's threshold of PTS is at 40dB recoverable TIS.[39] ..... [36] GOA-DEIS 3.8-88-92 [37] e.g.: Ward., W.O. "Recovery from high values of temporary threshold shift." J. Acoust. Soc/ Am., 1960. Vol. 32:497-500. [38] Miller, J.D., C.S. Watson, and W.P. Covell. 1963. "Deafening effects ofnoise on the cat."Acta OtoLaryngologica Supplement Vol. 176:1-91. [39] The DEIS states further that "A variety ()fterrestrial mammal data sources point toward 40 dB as a reasonable estimate of the largest amount ofTS that may be induced without PTS" though no citations are provided for this statement.	
Ocean Conservation Research - 75		The cat is also a highly visually adapted terrestrial animal, though it is more dependent on aurality than humans.[40] One correlation can be deduced here is that animals that are more· dependent of sound cues are less able to recover from extreme TTS. Thus if there is a 10 dB disparity in recovery levels between humans (50dB TTS) and cats (40dB TTS), it might easily follow that cetaceans who rely almost exclusively on acoustical cues would be even less likely to recover from extreme TTS and may indicate a PTS threshold at TTS level of30dB. If we use this assumption, the onset of PTS in·cetaceans may only be 15dB above the onset ofTIS,[41] not the "conservative" 20dB modeled in the DEIS. Given the forgoing, we might assume from the data presented in the OEIS that the onset of TTS occurs at 185dB re: IJ.tPa2-s (as shown in the OEIS without incorporating the "statistical mean" tool), and that the onset of PTS could then be as low as 200dB re: 1J.tPa2-s (taking the above assumption about recoverable TTS levels in highly acoustically-adapted animals). While these revised numbers are "lower" than the proposed thresholds ofTTS and PTS (suggested for all marine mammals), they are based on assumptions that are still of questionable validity, inasmuch as they are based on extrapolated models that meld terrestrial, highly visual animals with old, test-weary odontocetes. I feel that this methodology provides a poor stand-in for a diverse variety of wild marine mammals, in their own habitat, being subjected to extreme levels of noise that they are not biologically adapted to or trained to expect. ..... [40] Ralph E. Beitel "Acoustic pursuit of invisible moving targets by	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		cats" JASA - 1996. Vol.105(6) p.3449 This paper indicates that cats will follow acoustic cues without needing to visually identify the cue, unlike humans, who will use an auditory cue to help localize a source ofnoise which they will then "look for." [41] Using the same extrapolation and linear regression found in the DBIS and using 30dB ITS as the maximum recoverable ITS level: There is a 24 dB TS difference between onset-TTS (6 dB) and onset-PTS (30 dB).The additional exposure above onset-TTS that is required to reach PTS is therefore 24 dB divided by 1.6 dB/dB, or 15dB.	
Ocean Conservation Research - 76		Regarding the DEIS section 3.8-92 "Criteria and Thresholds for Level B Harassment from Non-TTS:" The authors of this section state that there is no metric to determine the "annoyance" levels of non-verbal animals. I suggest that the subjective term "annoyance" be replaced with the more observable characteristic of "disturbance." Many papers on disturbance levels in marine mammals are available[42] and can be used in lieu of trying to find published papers on the subjective "annoyance levels." The behavioral effects section 3.8-92 does mention that "...there are few observations and no controlled measurements of behavioral disruption of cetaceans caused by sound sources with frequencies, waveforms, durations, and repetition rates comparable to those employed by the tactical sonars to be used on the proposed TMAA." This statement is the first indication in the DEIS that the authors have identified that the paucity of data derived from exposing animals to actual sonar signals is a shortcoming of the analysis. ..... [42] e.g.: John R. Buck, Peter L. Tyack "An avoidance behavior model for migrating whale populations" The Journal of the Acoustical Society of America, April 2003. Volume 113, Issue 4, p. 2326 wherein gray whale avoidance threshold of 135dB re: luPa was established. See also w.e. Verboom and R.A. Kastelein. "Some examples of marine mammal 'discomfort thresholds' in relation to man-made noise." June 22, 2005. Proceedings from the 2005 Undersea Defense Technology conference 2005, Sponsored by TNO, P.O. Box 96864, 2509 JG The Hague, The Netherlands.	This comment is duly noted.
Ocean Conservation Research - 77		The "risk function adapted from Feller"[43] could prove to be a useful tool, but like any model, the output is only as good as the input. As such, any data using the trained and long-term habituated animals at the San Diego test facility must be categorically dismissed because the sec animals have been treated as "biological input devices" and thus are a very poor analogy of wild animals. Surprisingly the conclusions in	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		the DEIS reflect exactly the opposite conclusion, although some of the shortcomings are addressed (limited species range and the animals trained for TTS tests, not behavioral tests). ..... [43] GOA-DEIS 3.8-94	
Ocean Conservation Research - 78		The data from the Haro Strait incident[44] should be tailored to reflect that the J-pod orcas were already being set upon by groups of whale-watching tour-boats (of which they must be habituated) so there is a probability that their "disturbance" thresholds would have been elevated from their non-set-upon or wild habitat state. Thus the impact risk thresholds modeled with the risk function using the Haro Strait data should be weighted down by some amount. While this is reflected in the DEIS, any weighting factor would be arbitrary. ..... [44] Fromm, D. 2004. "Acoustic Modeling Results of the Haro Strait For 5 May 2003." Naval Research Laboratory Report, Office of Naval Research, 30 January 2004.	This comment is duly noted.
Ocean Conservation Research - 79		In the absence of empirical data some model must be used. The risk function is heading in the right direction, but with the limited input sources the weighting should favor a lower threshold than what unweighted inputs from Haro Strait and SCC inputs would yield. We believe that the Nowacek data[45] is the "cleanest" of all three, but as noted in the DEIS the alerting signals do not approximate MFA Sonar signals, although the relatively low behavioral threshold for mysticetes is supported by Di Iorio and Clark[46] in seismic sparker signals. ..... [45] Nowacek, D.P., M.P. Johnson, and P.L. Tyack. 2004. North Atlantic right whales (Eubalaena glacialis) ignore ships but respond to alerting stimuli. Proceedings of the Royal Society of London, Part B 271 :227231. [46] Lucia Di Iorio and Christopher W. Clark "Exposure to seismic survey alters blue whale acoustic communication" Biol. Lett. 23 February 2010 vol. 6 no. I 5l-54	This comment is duly noted.
Ocean Conservation Research - 80		Meanwhile excluding the fairly comprehensive and robust harbor porpoise data from the input set, or modifying the same risk function curve used in the other three inputs is arbitrary. With the paucity of data - both in terms of studies as well as species, qualified data should not be excluded	This comment is duly noted.

ID	Organization	Public Comment (Written)	Navy Response
		from the input data set, nor should any clean data be modified to accommodate for arbitrary considerations just because the data does not fit the desired outcome of the model. The fact is that the years of Kastelein data on harbor porpoises more accurately represent the behavioral responses of near wild animals because 1) these animals are the most recently wild captive animals, 2) the testing done on these animals is done with signals more characteristically akin to MF and HF sonar, 3) the tests are focused on behavioral responses, not operant conditioning, and 4) the testing environments have been specifically designed or cited to eliminate high levels of background noise and specular reflections found in most training enclosures.	
Ocean Conservation Research - 81		Additionally, tailoring the harbor porpoise data because they "inhabit shallow and coastal waters suggest[ing] a very low threshold level of response for both captive and wild animals"[47] flies in the face of glomming together mysticetes and odontocetes that do fit a convenient risk function. If the justification for melting together three disparate species under three disparate conditions is due to the paucity of behavioral data available, then the Tyack et. al[48] controlled exposure work on beaked whales should not have been excluded from the data set. This is particularly the case since the exposure tests were funded by the US Office o(Naval Research and included beaked whales - a species of particular concern. Perhaps the Tyack results were not included because they showed behavioral responses to signal Receive Levels as low as 117 dB (re: 1 J.lPa)? In section 3.8-106, Table 3.8-7a "Approximate Distance to Effects for At-Sea Explosives in the Temporary Maritime Activities Area" the metric is not stated. Are these feet or meters? Without this data the table is meaningless. [47] GOA-OBIS 3.8-101 [48] Tyack, P. et. al.. "Effects of sound on the behavior of toothed whales." J. Acoust. Soc. Am. Volume 123, Issue 5, pp. 2984-2984 (May 2008)	This comment is duly noted. The units of measure (meters) for the approximations have been added to the table.
Ocean Conservation Research - 82		Regarding the general topic of behavioral responses to explosions, it is extremely reductionist to assume that agonistic response linearly correlates to exposure level regardless of the signal source or characteristic. The DEIS assumes that the response value of an explosion is	This comment is duly noted

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		equivalent to the response value of other impulsive but natural sounds such as thunder or calving icebergs. I don't believe that it would be too anthropomorphic to assume the analogy to human response to explosions; and that our response to explosions in our own neighborhood, or even across town would definitely be different than our response to thunder.	
Ocean Conservation Research - 83		The clear fact is that explosions from military ordnance have the acoustical signature of things being destroyed. Regardless of the collateral damage to animals and habitat, military explosions are a product of destruction. This plays into physiological impacts and behavioral responses, but also into psychological disruption, inducing stress and anxiety, compromising biological function. The DEIS fails to bring this into the discussion.	The criteria described in Section 3.8 involving explosives and marine mammals was developed in cooperation with National Marine Fisheries Service (NMFS) and has been used extensively for years by NMFS for all activities involving these types of impacts in the water; for examples see [http://www.nmfs.noaa.gov/pr/permits/incidental.htm#applications].
Ocean Conservation Research - 84		Additionally, despite the appearances presented in the inverted impact model used to examine the impacts of explosions on fish (evaluated in this document), explosions will cause fish mortality and habitat destruction which will in turn compromise food abundance for marine mammals. To what extent is not included in the DEIS analysis.	This supposition, however, does not change the conclusion that there may be injury or mortality to individual fish but the proposed actions would not result in impacts to fish populations in the Gulf of Alaska.
Ocean Conservation Research - 85		For the foregoing reasons we advise the "No Action Alternative" be used. In the event that the US Navy sees to dismiss the foregoing arguments, or accommodates them to their best "practicable manner" and proceeds with Action Alternative 1 or Action Alternative 2, we advise the deployment of third-party (non military) aerial and marine observers to scan coastlines and littoral waters for marine mammal stranding incidents during the exercises. The GOA is sparsely populated with very long stretches of uninhabited coastline. Should some catastrophic impacts of the TMAA operations kill or maim marine mammals causing them to strand there is a high probability that the event would go unnoticed or unreported without an active, non-biased watch. Sincerely, Michael Stocker Director	Please see Section 5.2.1.6 regarding the many reasons why many of the previously suggested mitigation measures (including use of 3rd party observers are in many ways not effective) or do not meet the requirement to train in a realistic manner. With regard to monitoring during and after a training event in the Gulf of Alaska, see Section 5.2.1.4 and with regard to investigations of potential strandings, Section 5.2.1.5 discusses development of a stranding response plan in coordination with National Marine Fisheries Service.
Susan Payne - 1		Dear Commander of the Navy and Ms. Burt, Your Gulf of Alaska DEIS does not offer the NO Action option	The Forty Most Asked Questions Concerning the Council on Environmental Quality's National Environmental Policy Act Regulations, Number 3, addresses the question of No-Action alternatives. For EISs that study management levels of

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			Federal assets, the no-action alternative is seen as the current management level of asset usage-in this case, status-quo as the current level of usage. The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027).
Susan Payne - 2		and does not provide any alternatives other than more of your action using LFA, which has been demonstrated to negatively impact marine life, outright death of marine mammals and the disruption of fish migration.	As stated above, the no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027). Alternatives 1 and 2 discuss the increase from these levels. This is the approach properly taken in developing alternatives for this EIS/OEIS. (See #3 of CEQ's Forty Most Asked Questions). The Navy has discussed all alternatives that were considered but eliminated in Section 2.3.2 and the consideration of the no-action alternative, alternative 1, and alternative 2 within Chapters 3 and 4 ensures the Navy's compliance under NEPA. Additionally, the Proposed Action does not include the integration of LFA into the alternatives considered in the Final EIS/OEIS.
Susan Payne - 3		As I have testified before, I am opposed to Navy activities that use active sonar and depleted uranium.	Your opposition to the use of sonar is noted. Please note that the use of depleted uranium is not part of the proposed action for this EIS/OEIS. For additional information, please see response to Carolyn Heitman - 44.
Susan Payne - 4		I propose that you change the dates of operations to more accurately reflect the conditions in which an attack on the US will likely occur, under the most severe conditions. This would be winter in the Gulf of Alaska. Your choice of summer in these proposed waters directly impacts migrating animals, and Endangered,	In Section 2.3.2.3 of the EIS/OEIS, the alternative of training outside of summer in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Susan Payne - 5		and fishermen trying to make a living on fish such as salmon that only migrate shoreward at this time. Your assertion that you need support services leads me to conclude that this summertime mission is just a salmon and halibut charter opportunity for the Navy.	Vessels chartered by the Navy to provide exercise support will not be engaged in fishing for the Navy.
Susan Payne - 6		You talk of realistic operations, then conduct your work in the winter.	As stated previously, the alternative of training outside of summer in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy and joint training opportunities and such alternatives were considered infeasible and were not evaluated further.
Susan Payne - 7		Depleted Uranium and other toxics will enter the food chain and accumulate in the tissues of marine mammals and	As stated previously in response to your comment in number 3 above, Depleted Uranium is not part of the proposed action for

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		commercially important fish species.	this EIS/OEIS. Please see response to Carolyn Heitman - 44 Additionally, .the total amounts of expended and hazardous materials for each alternative are summarized in Tables 3.2-10, 3.2-14, and 3.2-19. The hazardous constituents of each type of ordnance, the estimated leaching rate, and the environmental fate of hazardous constituents are listed in Section 3.2.1.1, based on the best available science. The amount of each hazardous constituent is an approximation based on the best information available. The exact amount of each hazardous constituent in each piece of ordnance varies. For example (pg. 3.2-6 of the Draft EIS/OEIS), "Based on standards established by American Society for Testing and Materials International, each steel bomb body or fin also may contain small percentages of carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, molybdenum, vanadium, columbium, or titanium, although typically present at less than 1 percent by weight." The effects of all expended materials would be equivalent to the sum of individual effects because of the large area in GOA, the low areal density of expended materials, and the low percentage of hazardous materials (about three percent of expended materials would be considered hazardous). The Navy's use of the TMAA would not be uniform. Based on Navy personnel experience, Navy training activities typically only use 20 percent of the available training area, as described in Section 3.2.2.3. Based on this conservative assumption and 20 years of Navy activities in the TMAA, the resulting 835 lb per nm^2 would yield a density of about 20 lb per acre, of which hazardous constituents would constitute only about 0.6 lb per acre (three percent of total). The seabed deposition of such quantities of hazardous materials would have an insignificant effect on the benthic environment.
Susan Payne - 8		We have spent millions of dollars and years trying to sell the purity of our fisheries. You in your actions on some of the most productive fisheries habitat in the world will contribute to the demise of our fish quality and our markets.	Please see Chapter 3 of the EIS/OEIS for the description and analysis and potential effects. Specifically, those effects to fisheries are found in Section 3.6. Cumulative impacts are described in Chapter 4. The continued presence of Navy training activities in the Gulf of Alaska should not result the bioaccumulation of toxic substances in marine mammals or fish, or their habitat. The Navy understands and appreciates the marine habitat. For further discussion on bioaccumulation, please see response to CDFU – 9.

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Susan Payne - 9		The cumulative effect of toxics on marine mammals will lead to deaths that cannot be quantified and attributed to your actions. How will you mitigate these impacts?	Chapter 4 of the EIS/OEIS addresses cumulative impacts on marine resources. The comment is essentially true given that as detailed in that section of the EIS/OEIS, Navy activities are an insignificant portion of human activities occurring in and around the Gulf of Alaska. The EIS/OEIS provides extensive descriptions of marine mammal mitigation. Please see Chapter 5 of the EIS/OEIS.
Susan Payne - 10		Finally, the Navy should conduct themselves under the same regulations that the general public must, the Endangered Species Act, the Marine Mammals Protection Act, and all other rules of the Land.	The Navy is in full compliance with all applicable Federal laws, regulations and statues, including the Marine Mammal Protection Act, the Endangered Species Act, and all applicable environmental laws, including NEPA and its requirements. For more information about the Navy's compliance with these and other regulatory requirements, see Section 6 of the EIS/OEIS.
Susan Payne - 11		Since your draft only allows for the continuance of these activities, then limit them to only the necessary, and locate and time them to impact the fewest. Sincerely, Susan Payne	Please see responses to Payne - 1, 2, and 4.
Andrea Peterson		My concern is that you are planning this testing at the height of our Alaskan summer in the nutrient rich waters off the Gulf of Alaska. Marine Mammal numbers are at their highest then because they are drawn to these waters to feed. I also know you will not be able to guarantee there are no marine mammals in the area being tested. Stellar sea lions and many of our whales are endangered. I'm not willing to sacrifice any of them to Naval/Air Force testing. Please find a spot without the rich environment, ocean life, and proximity to shore. This seems to be one of the worst sites and seasons possible. Whales are most active in Alaskan waters from mid April through October, and we always have some whales in our waters year round. I'm not sure what the answer is, but testing under these conditions will be damaging to our environment and ocean creatures.	As detailed in Chapter 2, none of the proposed Navy training activities involve "testing". As explained in Section 2.3.2.1 of the EIS/OEIS, a relocation of training activities would not support the Navy's purpose and need and was therefore eliminated from further consideration. In reference to your comment's guaranteeing no marine mammals will be present, the Navy's proposed mitigation measures presented in Chapter 5 and developed with National Marine Fisheries Service as a cooperating agency are not meant to suggest the ability to detect 100% of the marine mammals in the water. The mitigation measures are meant to reduce the impacts from the proposed actions while still enabling vital Navy training to occur.
Mike Peterson-1		Like many in the State of Alaska, I am concerned about the effects of sonar to the sealife within the Gulf.	The Navy has been conducting mid-frequency and high-frequency active sonar activities for decades at training ranges on the East Coast, in Hawaii, and Southern California, where for example, populations of resident beaked whales and other marine mammals appear to be thriving and fisheries remain very productive. There have been no indications for broad-scale impacts that are either injurious or of significant

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			biological impact to marine mammals or other sea life at these training ranges where the majority of Navy training at sea has been taking place for many years. As presented in Chapter 3 of the EIS/OEIS, the Navy's analysis for the Gulf of Alaska demonstrates there is little relative risk to marine species in the Gulf of Alaska.
Mike Peterson-2		As a Vietnam Veteran I remain distrustful of military motives in peaceful waters.	This comment is duly noted.
Mike Peterson-3		I would advocate for a 60 day period of observation, after the exercises, to document any and all damage that may have resulted from any testing to the marine life of the Gulf - within the boundaries as set forth by the U.S. Navy for the purpose of this training. All documented material would be turned over to State DNR, Secretary of the Interior, Dept. of Alaska Fish and Game Governor's office, and local newspaper in Anchorage, Juneau, Kodiak, Seward and Dutch harbor.	Section 5.2.1.3 describes monitoring planning for the TMAA. The Navy has begun an Integrated Comprehensive Monitoring Program for all its Range Complexes as a condition to permitting under the Marine Mammal Protection Act. The Integrated plan and the Range Complex specific monitoring plans are available on the NMFS Office of Protected Resources website. The results from those monitoring efforts will be provided by the Navy to NMFS and posted on the website as well. A monitoring plan for Navy activities in the TMAA will also be implemented with the research aims and timing tailored to questions that could be answered by studies done in the Gulf of Alaska area. For further information on the Navy's monitoring programs, please refer to AMCC – 7.
Carolyn Ramsey - 1		Dear Ms. Burt, I am writing to you as a concerned citizen and resident of Anchorage, Alaska. This letter addresses a few of my concerns about the *Gulf of Alaska Navy Training Activities Draft EIS/OEIS*. I understand that the U.S. Navy has "identified the need to support and conduct current, emerging, and future training activities". I understand that the men and women in our United States Military require such training so that they can be prepared for any and all situations that may arise. This training however needs to remain at the No Action Alternative.	This comment is duly noted. Please see response to AMCC – 3.
Carolyn Ramsey - 2		The other option would be for the U.S. Navy to find another location away from the vast marine and endangered species that inhabit our Alaskan waters.	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included alternate locations. Such alternatives fail to meet the purpose of and need for the proposed action. The proposed area for Navy training in the TMAA is based on the mission of Alaska Command to support the needs of military forces within Alaska, forces deploying through Alaska, and joint training needs.
Carolyn Ramsey - 3		As noted in the Draft EIS/OEIS Appendix F page F-18 "Animals in or near an intense noise source can die from profound injuries related to shock wave or blast effects."	The science of sound in the water and its effects on marine life is evolving. The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current

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		Alaska Department of Fish and Game has developed blasting standards that say "no person may discharge an explosive that produces or is likely to produce and instantaneous pressure change greater than 2.7 pounds per square inch in the swim bladder of a fish". Considering salmon, whales and other various marine species either are fish or rely on these fish.	and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. Navy training activities that result in underwater explosions are a critical requirement of training. Precautions are taken to limit exposing marine life to the effects of an explosion as detailed in Chapter 5, mitigation measures.
Carolyn Ramsey - 4		The risk to our Alaskan food chain is unacceptable under the Alternative 1 and Alternative 2 proposals. Alaska's economy is based in natural resources and the seafood industry is its third most important natural resource. The No Action Alternative is the only option.	Please see Chapter 3 of the EIS/OEIS for the description and analysis and potential effects to natural resources in the TMAA. Specifically, those effects to the economy are found in Section 3.12 and to marine life in Sections 3.5 through 3.9. Regarding affecting fishing and tourism, please see response to AMCC - 14. Overall, the analysis in the EIS/OEIS shows that the Navy's proposed action will not significantly impact the marine environment of the GOA. As described in Chapter 4, the Navy activities proposed are small in comparison to the impact from commercial fishing in the Gulf of Alaska.
Carolyn Ramsey - 5		As noted in the Draft EIS/OEIS Appendix F page F-18 "Acoustic exposures have been demonstrated to kill marine mammals and result in physical trauma, and injury (Ketten 2005)." Mass stranding of beaked whales and porpoise have been reported in association with the use of active sonar. The disorientation and unusual behavior patterns in whales, porpoise, and many other various marine mammals have been reported in association with the use of active sonar. With the vast marine and endangered species that inhabit the Gulf of Alaska the use of active sonar in any degree is unacceptable. The No Action Alternative is the only option.	While it is true that acoustic exposures can indirectly kill marine mammals, the sound source has to be very loud and the animal very close for this to be a direct effect. Navy sonar training minimizes the chance of marine mammals being present through mitigation measures agreed upon with NMFS. Mass strandings of beaked whales have occurred as described in Appendix F, however, this occurrence is relatively rare and the conditions leading to it happening are not well understood. The Navy has conducted mid-frequency and high-frequency active sonar activities for decades with no indications of injuries to resident beaked whales at training ranges in Hawaii and Southern California. There are no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Carolyn Ramsey - 6		The temperatures of the Gulf of Alaska range from approximately 40-50 degrees, due to these cold temperatures it will take the expended ordinances hazards material much longer to degrade and dissipate therefore placing the marine ecosystem in the Gulf of Alaska in even greater danger for an even longer period of time. Again this is another reason Alternative 1 and Alternative 2 are unacceptable. The No Action Alternative is the only option.	Cold water would reduce the rate of corrosion and breakdown of expended materials (Bayliss et al. 1988), resulting in lower concentrations of hazardous materials in surrounding water quality. Water currents would disperse leaching materials, and would not result in toxicity around expended materials, as discussed in Sections 3.2.1.1 and 3.2.2. Text on the effects of temperature on the rate of corrosion has been added to Section 3.2.1.1 of the Final EIS/OEIS.

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Carolyn Ramsey - 7		I suggest that the U.S. Navy continue its development of interactive computer simulation software and hardware that can be used to train its sonar technicians. This will assist in limiting the damage done to the earth's marine life. Man-kind has been doing irrefutable damage to our earth and the life that inhabits it for many years. The damage to the ecosystem is growing each and every day.	Navy and Marine Corps training already uses of computer-simulated training and conducts command and control exercises without operational forces (constructive training) whenever possible. Increased simulation of ASW warfare does not meet the necessary requirements to maintain proficiency. Simulation training as an Alternative was considered, but eliminated in Section 2.3.2.4.
Carolyn Ramsey - 8		While I understand the United States Navy needs to train it personnel, the risk of further damage to Alaska's fragile marine environment must be kept at a minimum. This is why the No Action Alternative is the only acceptable option. Respectfully, Carolyn Ramsey.	This comment is duly noted.
Carl Ranney		I think that the shelling in the gulf won't have any major effects on the wildlife. In fact I think that the fragments from the destroyed ship if it land on flat sea bed will actually provide fish habitat.	This comment is duly noted.
Kris Ranney	Boyscouts	I was wondering if the sinking of ships in the Gulf would affect the halibut population there. As far as I know the area where you will sink ships is also home to this deep water fish species, most leave for the warmer shallow waters closer to shore in the summer but the larger fish do not come as close, some may stay over the shelf. It takes 25 years for on of these fish to go over 100 pounds, if you hit and killed a 600 pound fish it would take hundreds of years to replace!	Regulations involving SINKEX require the activities take place more than 50 miles from the coast and in over 1,000 fathoms of water, which is beyond the continental shelf. It is extremely unlikely there would be impacts to halibut as a result of conducting a SINKEX event.
Libby Riddles - 1	Blazing Kennels	Dear Mrs. Burt, I urge you to reconsider doing especially sonar testing in the Gulf of Alaska between Prince William Sound and Kodiak and also in the Seward area. Our ocean wildlife takes enough of a hit between [the following:] the occasional oil spills, the over-fishing, the acidification of the ocean, and other factors. Adding unreasonable risks to animals like sea lions, whales, seals, sea otters and other marine wildlife including the fish just doesn't make any sense.	The Navy shares your concern for marine resources The Navy is a leader in funding research to better understand marine species so that training activities can be conducted with the least possible impacts. Chapter 3 of the EIS/OEIS provides the details of the Navy's analysis and demonstrates that there is little relative risk to living marine resources from sonar use or other training exercises as proposed in the Final EIS/OEIS. Regarding an alternate location, please see response to Carolyn Ramsey – 2. Regarding oil spills, the TMAA is many miles distant from and does not include Prince William Sound where the Exxon spill occurred. In addition, Chapter 22 of OPNAVINST 5090.1C provides specific guidance on how Navy vessels underway must handle oil and oily wastes (Section 22-5 of OPNAV INST 5090.1C), hazardous materials (Section 22-6), solid wastes (Section 22-7) and medical wastes (Section 22-8). Additionally, Section 22-9 of OPNAVINST 5090.1C provides

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			very specific guidance on the requirements for preparing for and dealing with any oil or hazardous substance spills
Libby Riddles - 2	Blazing Kennels	Sonar has been proven to be very stressful to mammals that use it for navigation especially, making them prone to beaching and other health issues we are just beginning to understand.	The Navy shares your concern for marine life. All of the possible effects you describe were analyzed in the EIS/OEIS. Also, as described in the EIS/OEIS, the Navy implements protective measures during its training exercises. The Navy is a leader in funding marine mammal research to better understand them and to operate with the least possible impacts.
Libby Riddles - 3	Blazing Kennels	We depend on these animals for subsistence, and also for the tourist trade, and they deserve to exist in their own right without unnecessary harassment.	Please see response to Libby Riddles – 1.
Libby Riddles - 4	Blazing Kennels	Please reconsider doing your practice sessions in areas that are not so sensitive to ocean wildlife, and the people that depend on them.	As described in Section 2.3.2.1, the Navy considered, but rejected, other alternatives because they failed to meet the purpose of and need for the proposed action. Regarding an alternate location, please see response to Carolyn Ramsey – 2.
Libby Riddles - 5	Blazing Kennels	Explosives and sinking ships in this area seems like a really bad ideas as well, for the same reasons. Thanks you for your consideration, Libby Biddles, Iditarod Champion Alaska Resident since 1973	The Draft EIS/OEIS thoroughly analyzes the impacts from proposed Navy training activities. Additionally, please see response to AMCC – 8. Regarding a SINKEX, the vessels are treated in accordance with EPA-mandated standards. Materials that could degrade the marine environment are removed to the maximum extent possible. The SINKEX permit is described in Section 3.2.2.2.
Richard Steiner - 1	Professor, Univ of Alaska Marine Advisory Program	I strongly recommend that the exercises be re-located farther offshore, to minimize impact to the shelf ecosystem. At a minimum, no potentially impactful activities should be conducted over or near the continental slop or shelf (shallower than 1000 fm or 2000 m depth).	Anti-Submarine Warfare (ASW) training remains one of the Pacific Fleet's (and the Navy's) highest priority requirements. For the U.S. Navy, the ability to conduct ASW in a variety of environment and bathymetric conditions, including in the vicinity of canyons and in the littorals is critically necessary in order to fight the growing submarine threat. The canyon allows a submarine to hide in an area that is shadowed by the canyon walls because the active transmission cannot reach the sub via the bottom bounce path. The littorals are important due to reduced maneuvering and the unique sound propagations in shallower water. Regarding an alternate location, please see response to Carolyn Ramsey – 2.
Richard Steiner - 2	Professor, Univ of Alaska Marine Advisory Program	As well, all activities should be conducted only from October - February to minimize impacts on seasonal migrant marine mammals and birds.	In Section 2.3.2.3 of the EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.

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Richard Steiner - 3	Professor, Univ of Alaska Marine Advisory Program	I recommend that any such exercises be conducted outside of 200 n. miles from shore, and only in winter, thereby minimizing impact on seasonal resources.	Regarding an alternate location, please see response to Carolyn Ramsey – 2. Additionally, such alternatives fail to meet the purpose of and need for the proposed action as an increase in the distance from shore would not allow for effective joint training. Additionally, as stated above, in Section 2.3.2.3 of the EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. However, unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Richard Steiner - 4	Professor, Univ of Alaska Marine Advisory Program	As well, independent marine mammal observers need to be included to clear the safety zone, a large zone needs established (at least to verify no harmful exposure to noise) and no exercises should be conducted.	Please see the discussion in Section 5.2.1.6 which details the reasons why the previously proposed use of third party observers and a larger safety zone have been eliminated from further consideration. Also note, Sections 5.2.1.3 and 5.2.1.4 discuss the monitoring has been proposed as part of a coordinated research program to help determine the effects of exposure to marine species from Navy training activities.
Stacy Studebaker - 1		Dear Mrs. Burt, The Navy visited Kodiak on Jan. 7 to brief the community on its proposed increase of training activities in the Gulf of Alaska (GOA) Temporary Maritime Activity Area (TMAA) which encompasses 42,146-square nautical miles just to the north of Kodiak Island. What least impressed me about the meeting was the Navy's arrogance and the lack of data in its presentation.	This comment is duly noted.
Stacy Studebaker - 2		I'm all for the readiness of our military, but not at the expense of vast amounts of marine life and the health of our immediate ocean environment upon which our community makes its living.	The Navy shares your concern for marine life and has conducted a thorough analysis of potential effects from its proposed activities in Chapter 3 of the EIS/OEIS. Specifically, those effects to marine life in Sections 3.5 through 3.9, water and sediment quality in Section 3.3, and economy in Section 3.12 have been analyzed. The Navy is confident, and the analysis indicates, that its training activities will not significantly impact the resources you mention.
Stacy Studebaker - 3		With our ocean's health and its ability to sustain life already compromised from so many other factors, the cumulative impacts, which you barely address, of these training activities in our area may cause irreparable harm to ocean life and losses to our local economy.	Effects of past, present and planned Navy activities have been discussed in Chapter 4; Cumulative Impacts. For the purposes of determining cumulative effects in this chapter, the Navy reviewed environmental documentation regarding known current and past Federal and non-Federal actions associated with the resources analyzed in Chapter 3. Additionally, projects in the planning phase were considered, including reasonably foreseeable (rather than speculative)

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			actions that have the potential to interact with the proposed Navy action.
Stacy Studebaker - 4		At the meeting the Navy discussed the 900-page Draft Environmental Impact Statement that it has been preparing for the last two years. It is now being circulated for public review. The EIS was boiled down to a few information bullets on posters stating nothing the Navy is planning to do in its exercises in the GOA would have any significant impacts on the environment! Any data upon which the Navy could make such unscientific claims were absent on the posters or in the presentation and woefully inadequate in the 900 page document.	The Navy believes that we have fairly and reasonably identified possible environmental impacts from our Navy training in the TMAA in our EIS/OEIS. Thank you for your participation in this public comment process.
Stacy Studebaker - 5		The Navy's proposed training activities in the GOA would pose significant risk to whales, fish, and marine birds that depend on the area for breeding, feeding, navigating, and avoiding predators, in short, for their survival.	All species in the range of influence of Navy activities in the GOA have been analyzed for individual and population level effects. The EIS/OEIS analyzes in detail the effects of Navy actions on specific resources and has determined that there would be no significant harm to marine mammals, fish, or birds. With regard to cumulative impacts, while marine mammals, fish, and birds may be affected, Navy activities will not present significant cumulative impacts to individual species, or to populations.
Stacy Studebaker - 6		Many exercises would employ mid-frequency active sonar, used to locate submarines, which has been implicated in mass injuries and mortalities of whales around the globe. The same technology is known to affect marine mammals in countless other ways, including inducing panic responses, displacing animals and disrupting crucial behavior such as foraging.	Please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding occurrences around the world.
Stacy Studebaker - 7		The Navy estimates that its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 424,620 marine mammal "takes" (behavioral impacts, harassment, injury, death) every year. That's more than 2.125 million takes during the course of the Marine Mammal Protection Act permit it must seek from National Oceanic and Atmospheric Administration. Those numbers don't even account for the animals that die as a result of your experiments and quickly sink to the bottom. How can the Navy claim a FONSI on marine mammals when you are applying for such a permit?	Please see response to Greg Brown – 1.
Stacy Studebaker - 8		In all, the Navy expects to "take" more than 20 different species of marine mammals, including seven endangered	There are three known species of beaked whales in the TMAA and these are covered in Sections 3.8.4.1, 3.8.4.2, and 3.8.4.9

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		species, in the GOA. Beaked whales are barely mentioned because very little is known about them or their habitats. There may be many species of these small whales in the GOA. They dwell in deeper waters in trenches where they feed on squid and are very vulnerable to sonar because of the natural amplification and concentration of sound in marine canyons. Since they can stay underwater for up to 2 hours, it is impossible to mitigate harm to them with visual monitoring from the deck of a ship. They are among the most vulnerable and you have barely mentioned them.	with additional information provided in Appendix F concerning information specific to stranding incidents. Navy recognizes it is very difficult to detect beaked whales and the estimated exposures are not reduced by any potential for mitigation as a result. Please note that the U.S. Navy has conducted mid-frequency and high-frequency active sonar activities for decades in areas such as Southern California and Hawaii where recent research has documented the long term presence of beaked whales with no apparent impact to those animals. For further information on beaked whales and sonar, please see response to MMC – 17.
Stacy Studebaker - 9		The Navy's expanded training activities in the GOA also would affect fisheries and essential fish habitat, damage hard bottom habitat, and release into coastal waters a variety of hazardous materials such as spent rounds of ammunition and unexploded ordnance containing chromium, chromium compounds, depleted uranium and other hazardous materials. The report estimates an extraordinary amount of spent material will result from Preferred Alternative (Alternative 2) including a large increase in the weight of expended materials (352,000 pounds) and 10,300 pounds of hazardous material.	All hazardous materials associated with Navy training activities would be expended in the TMAA, which is beyond 12 nautical miles from the closest shoreline. With regard to expended and hazardous materials, please see response to AMCC - 15. With regard to depleted uranium, please see response to Carolyn Heitman - 44. Furthermore, on Aug 2nd, 2010, the Navy submitted an Essential Fish Habitat Assessment (EFHA) to NMFS for analysis of impacts of its proposed activities upon the habitat.
Stacy Studebaker - 10		That does not include entire ships the Navy plans to sink as part of its exercises.	Ship hulks used for SINKEXs would vary in weight, and estimation of the ship's weight across 8 square nautical miles would not be accurate. A SINKEX permit from the EPA would require removal of hazardous materials from ship hulks prior to sinking. Based on comments by EPA on the Draft EIS/OEIS, additional text regarding removal procedures and remaining amounts of PCBs has been added to Section 3.2.2.2 of the Final EIS/OEIS.
Stacy Studebaker - 11		No data were presented on the impacts of sonar on fish and in particular, schools of salmon that swim directly through the test area.	Section 3.6 (Fish) of the EIS/OEIS thoroughly analyzed impacts to fish, including salmon, from proposed Navy training activities, including sonar. The EIS/OEIS concludes that there is no significant impact to population levels of fish.
Stacy Studebaker - 12		Nearly all of the mitigation measures the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far-reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast-moving vessels by a few people standing on the deck with binoculars. Most fishermen would agree that it is impossible, even under the best conditions in	Please see response to Katherine McLaughlin – 5 & 6.

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		the open ocean, to spot anything on the surface of the ocean. The Navy is not planning to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife.	
Stacy Studebaker - 13		For example, no protection areas are proposed for harbor and Dall's porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the TMAA; for endangered humpback whales, sei and blue whales, which gather to feed in the TMAA; or for the critically endangered short-tailed albatross or North Pacific right whales, whose critical habitat is directly adjacent to the TMAA.	Regarding protection areas, please see response to Katherine McLaughlin – 6. Regarding the short-tailed albatross, please see response to Greg Brown – 17.
Stacy Studebaker - 14		The Navy underestimates the number of marine mammals, fish and birds that will be harassed, injured and killed because it simply does not have the density estimates needed in order to accurately make this determination. The National Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. Here, the Navy failed to obtain data that is essential to its analysis. In addition, there are simply no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in the GOA. How can you claim "Finding of No Significant Impact" when you don't even know what's there?	Please see response to AMCC - 8.
Stacy Studebaker - 15		The Navy does not attempt to address the effects of sonar and contaminants on plankton, the very base of our marine food chain and only briefly addresses the cumulative impacts on the marine ecosystem.	Effects of Navy training exercises on plankton are described in Marine Plants and Invertebrates, Sections 3.5.2.3 and 3.5.2.4.
Stacy Studebaker - 16		The Navy's alternative analysis also is inadequate. The Navy only presents three options; No Action Alternative - maintaining the present levels of training without sonar, Alternative (1) - add more training with sonar, or Alternative (2) - add even more intensive training with a lot more sonar. It does not consider any other alternatives, some employed by the Navy itself in other training exercises and ranges.	Please see response to AMCC – 4.
Stacy Studebaker - 17		Finally, and most critically, the Navy does not offer adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual	Please see response to AMCC - 7.

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		monitors. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." For instance, studies show that visual monitoring only spots about 5 percent of marine mammals. Statistically, a 5 percent "success" rate clearly does not cut it.	
Stacy Studebaker - 18		In conclusion, there is no scientific basis for the claims you make that nothing you are proposing to do in your test area, and in our back yard, will have any significant impacts on marine life. You are coming to Alaska to test this deadly technology because you have been legally blocked from doing so in other states and your assumption is that you can get away with it here because of our small, scattered population that won't put up much of a fuss. Please don't do any more harm to our ocean and adopt the No Action Alternative. Sincerely, Stacy Studebaker Stacy Studebaker is a biologist, a 3D-year Kodiak resident and coordinator of The Kodiak Gray Whale Project.	The Navy has not been blocked from training with active sonar in any areas of the ocean and is seeking to continue joint training in the waters of the proposed TMAA because an alternate location for Navy training in the ATAs that meets the purpose of and need for the Proposed Action does not exist. For additional information on an alternate location, please see response to Carolyn Ramsey – 2. The purpose and need of the proposed action can be found in Chapter 1 of the EIS/OEIS. In summary, in order to implement its Congressional mandates, the Navy needs to support and conduct current and emerging training activities in the GOA ATA's and upgrade or modernize training capabilities to enhance and sustain Navy training. These objectives are required to provide combat capable forces ready to deploy worldwide in accordance with U.S.C. Title 10, Section 5062.
Suzanne Torian - 1		I am categorically opposed to the Gulf of Alaska navy Training activities as proposed. Please do not allow this activity to proceed. Suzanne Torian	This comment is duly noted.
Trustees For Alaska - 1		**Trustees for Alaska** Re: Comments on Gulf of Alaska Navy Training Exercises Draft Environmental Impact Statement/Overseas Environmental Impact Statement. On behalf of the Alaska Community Action on Toxics, Alaska Marine Conservation Council, Center for Biological Diversity, Cook Inletkeeper, Kodiak Audubon Society, Kodiak Gray Whale Project, North Gulf Oceanic Society, Prince William Soundkeeper, and Turning the Tides, Trustees for Alaska submits the following comments on the Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement for proposed Gulf of Alaska Training Exercises.[1] The Navy proposes a series of training exercises in the Gulf of Alaska (GOA) and Alaska's inland training areas, collectively referred to as the Alaska Training Areas (ATA). Within the ATA, the Navy has delineated the GOA Temporary Maritime Activity Area (TMAA), a 42,146 square nautical miles (nm) zone south of	For EISs that propose a new tempo of current training, the no-action alternative is seen as the current management level of asset usage-in this case, status-quo as the current level of training area usage. For further information, please see response to AMCC – 4.

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		Prince William Sound and east of Kodiak Island. The purpose of the Proposed Action is to achieve and maintain fleet readiness using the ATA to support and conduct current, emerging, and future training activities. Gulf of Alaska Navy Training Exercises Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS/OEIS) at 1-2. The need for the Proposed Action is to enable the Navy to meet its statutory responsibility to organize, train, equip; and maintain combat-ready naval forces and to successfully fulfill its current and future global mission of winning wars, deterring aggression, and maintaining freedom of the seas. Id. The DEIS/OEIS only considers three alternatives, including the no action alternative. With regards to actions in the TMAA, the two action alternatives only differ in the number of exercises (with Alternative 2, the preferred alternative, including a second' 21-day training exercise in the GOA) and the addition of a sinking exercise under Alternative 2. [1] Trustees for Alaska incorporates by reference comments submitted by other government agencies, individual scientists, environmental organizations and the public.	
Trustees For Alaska - 2		The Navy estimates that its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 424,620 marine mammal "takes" (behavioral impacts, harassment, injury, death) every year. DEIS/OEIS at 3.8-147. Over the course of the five year Letter of Authorization (LOA) permit, to be issued under the Marine Mammal Protection Act (MMPA), total take would exceed 2.125 million. In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the GOA.	Regarding “takes” please see response to AMCC – 8. Regarding exposure methodology exposure, please see response to Katherine McLaughlin – 4.
Trustees For Alaska - 3		1. The Navy's proposed exercises and the use of mid-frequency sonar pose unacceptable harm to marine mammals and the Navy has failed to fully assess available mitigative measures. Trustees for Alaska fully supports the comprehensive comments submitted by the Natural Resources Defense Council regarding the impact of the proposed use of mid-frequency active (MFA) sonar on marine mammals in the GOA. Trustees for Alaska reiterates, briefly, the major concerns with mid-frequency sonar use in the GOA and the	The Navy fully analyzed potential impacts to marine life in section 3.8 (Marine Mammals) of the EIS/OEIS. The analysis concludes that there is no significant impact to population levels of marine mammals. Section 5.2.1.3 describes monitoring planning for the TMAA. The Navy has begun an Integrated Comprehensive Monitoring Program for all its Range Complexes as a condition to permitting under the Marine Mammal Protection Act. The Integrated plan and the Range Complex specific monitoring plans are available on the NMFS Office of Protected Resources website. The results from

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		lacking DEIS/OEIS analysis of impacts from the training exercises in the GOA.	those monitoring efforts will be provided by the Navy to NMFS and posted on the website as well. A monitoring plan for Navy activities in the TMAA will also be implemented with the research aims and timing tailored to questions that could be answered by studies done in the Gulf of Alaska area. As described in the EIS/OEIS, the Navy implements protective measures during its training exercises. These protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate.
Trustees For Alaska - 4		First, nearly all of the mitigation measures that the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast moving vessels.	Regarding safety zones, please see response to Katherine McLaughlin – 5.
Trustees For Alaska - 5		Second, the Navy has not proposed to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife. For example, no protection areas are proposed for harbor porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the TMAA; for endangered humpback whales and blue whales, which gather to feed in the TMAA; for the critically endangered North Pacific right whale, who's critical habitat is directly adjacent to the TMAA; or for any other species or habitat.	Regarding protection areas, please see response to Katherine McLaughlin – 6.
Trustees For Alaska - 6		Third, the Navy's acoustics impact analysis ignores scientific studies contrary to its interests and uses methodologies not supported by the scientific community. Thus, the thresholds it sets for permanent injury, temporary injury (hearing loss) and behavioral change are invalid as a matter of science. For instance, in setting its thresholds at 195 dB for harassment and temporary injury and 215 dB for permanent injury and death, the Navy ignores a 2004 study by Nowachek et al which found that right whales respond to	Please see response to Katherine McLaughlin – 9.

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		mid-frequency sound below 140 dB (the sound caused them to stop eating and ascend rapidly to just below the surface, making them extremely vulnerable to ship strikes).	
Trustees For Alaska - 7		Finally - and most critically - the Navy does not set forth adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual monitors. See DEIS/OEIS at 5-12. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." Natural Resources Defense Council v. Winter, 527 F.Supp.2d 1216, 12211222 (C.D.Cal. 2008). Studies indicate that visual monitoring only spots about 5% of marine mammals. Statistically, a 5% "success" rate is absolutely insufficient to be considered an effective mitigative measure. The DEIS/OEIS is also inadequate because it fails to acknowledge that the Navy has employed other more successful mitigation measures during previous training. These measures (which include some of the same mitigation measures environmental conservation organizations have supported but the Navy now claims cannot be employed) include siting exercises beyond the continental shelf and Gulf Stream, relocating exercises out of important habitat and to avoid certain species, and using a technique called "simulated geography" to avoid canyons and nearshore areas on at least three of its major ranges. The Navy has also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time. Although Chapter 5 of the DEIS/OEIS describes "alternative mitigation measures considered but eliminated," it fails to explain why these measures are not employable when they have been adopted and successfully implemented in the past. See DEIS/OEIS at 5-28. The Navy's claim that it cannot implement more protective mitigation measures is therefore unsupported by the DEIS/OEIS.	Please see response to AMCC – 7.
Trustees For Alaska - 8		2. The OEIS/OEIS fails to take the requisite "hard look" at the impacts of the proposed action on endangered species and critical habitat. Several endangered and threatened species may occur within in the TMAA including: various listed salmonids (Chinook salmon, coho salmon, chum salmon, sockeye	Chapter 3 of the EIS/OEIS provides an analysis of the proposed action with regard to marine life within the TMAA. With regard to Endangered Species, Sections 3.6 (Fish), 3.7 (Sea Turtles), 3.8 (Marine Mammals), and 3.8 (Birds) provide details (including Critical Habitat) for each of these marine species. Please note, none of the sea turtles mentioned in the

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		salmon, and steelhead), various sea turtles (leatherback, loggerhead, green, and olive ridley), blue whales, fin whales, humpback whales, sei whales, sperm whales, North Pacific right whales, stellar sea lions, and short-tailed albatross. The DEIS/OEIS fails to adequately assess the impacts of the proposed action on endangered species, nor how adverse impacts will be minimized and mitigated.	comment, except leatherbacks which were analyzed in detail, are likely to be present in the TMAA (as discussed in Section 3.7, pages 3.7-1 and 3.7-2). Chapter 4 presents the potential cumulative impacts on these species. With regard to how adverse impacts will be minimized and mitigated, please See Chapter 5, Sections 5.1 through 5.2.1.2 (inclusive). Regarding the short-tailed albatross, please see response to Greg Brown – 17.
Trustees For Alaska - 9		The DEIS/OEIS fails to provide a proper analysis of the serious impacts its sonar training and expended materials will have on the critically endangered North Pacific right whales, whose critical habitat is only 12 nautical miles from the TMAA or the endangered gray whales, which migrate through the TMAA.	As noted in previous responses, the Navy's analysis of sonar and expended materials (Sections 3.8 and 3.2 of the EIS/OEIS respectively) indicates that the Proposed Action will not affect populations of North Pacific right or gray whales in the TMAA.
Trustees For Alaska - 10		3. The DEIS/OEIS fails to provide a satisfactory analysis of impacts, based on complete data. The OEIS/OEIS underestimates the number of marine mammals (and fish) that will be harassed, injured and killed because the Navy simply does not have the density estimates needed in order to accurately make this determination. The National Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. The simple assertion that "no information exists" does not excuse the Navy from conducting the requisite analysis to fully understand the impacts of its proposed action and make a reasoned choice amongst its alternatives. See 40 C.F.R. § 1502.22(a) (unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained). The Navy failed to obtain data essential to its analysis. The Navy itself admits that it has no density estimates for endangered blue whales, North Pacific right whales, sei whales, sea turtles, California sea lion, harbor porpoise, and harbor seal.3.7-2 and 3.8-109. In addition, there are simply no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in the GOA. Despite the lack of survey/density data, the Navy simply estimates that only 1 blue whale, 1 North Pacific right whale and 4 sei whales may be harmed by its use of sonar because of the "rareness" of those whales. NEPA requires more. It requires these surveys to be completed and included in the impacts analysis.	Please see response to AMCC – 8.

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Trustees For Alaska - 11		4. The DEIS/OEIS cumulative impacts analysis fails to provide quantified and detailed information about other activities that may cumulative impact the environment, including marine mammals and fish. The DEIS/OEIS cumulative impacts analysis is inadequate because it fails to provide the requisite quantified and detailed information about other activities and associated impacts. Table 4-1 simply lists projects that could have potential cumulative impacts with the proposed activity in the GOA without actually analyzing what those impacts will be. NEPA requires that agencies provide quantified and detailed information about past, present and reasonably foreseeable projects that support an analysis of the impacts associated with those other projects. Table 4-1 fails to provide the requisite detail or an analysis of how these other projects cumulative impact the environment.	The cumulative impacts analysis addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. Table 4-1 succinctly depicts the categories of past, present, and reasonably foreseeable future actions that affect cetacean and fish populations. Identifying such activities and in fact comparing them for relative impacts is an appropriate approach to cumulative impacts analysis, which is what was done in Chapter 4, Section 4.2. The EIS/OEIS does more than simply compare activities; it analyzes in detail the effects of Navy actions on specific resources and places those in the context of other sources of impacts. With regard to marine mammals and fish, the cumulative impacts analysis accurately concludes that Navy activities, while they may affect species, will not present significant impacts, or population level impacts to any species.
Trustees For Alaska - 12		5. The DEIS/OEIS range of alternatives is inadequate. The Navy's range of alternatives is far too narrow in scope and has improperly failed to consider other reasonable alternatives. The Navy only considers three alternatives: the no-action alternative (maintain the status quo); increase training activities to include the use of active sonar, and; increase training activities to include the use of active sonar, conduct one additional summertime CSG exercise annually beyond that in Alternative 1, and sink up to two ships with a variety of ordnance. In other words, the DEIS/OEIS considers no action, increased training with sonar, and even more training with sonar and exercises that involve sinking vessels. The DEIS/OEIS fails to consider any other alternatives such as training measures that do not include MFA. Alternatives that include increased training with sonar and even more increased training with sonar do not amount to a "reasonable range of alternatives," as required by NEPA.	NEPA regulations both require analysis of a no-action alternative and provide that in situations involving ongoing activities, as with Navy actions in the GOA ATAs, that it is appropriate for the no-action alternative to reflect a baseline of ongoing actions. For EISs that study management levels of Federal assets, the no-action alternative is seen as the current management level of asset usage-in this case, status-quo as the current level of range usage. The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027). Alternatives 1 and 2 discuss the increase from these levels. This is the approach properly taken in developing alternatives for this EIS/OEIS. (See #3 of CEQ's Forty Most Asked Questions). The Navy has discussed all alternatives that were considered but eliminated because they did not meet the purpose and need in Section 2.3.2 and the consideration of the no-action alternative, alternative 1, and alternative 2 within Chapters 3 and 4 ensures the Navy's compliance under NEPA. The purpose and need of the proposed action can be found in Chapter 1 of the EIS/OEIS. In summary, in order to implement its Congressional mandates, the Navy needs to support and conduct current and emerging training activities in the GOA ATA's and upgrade or modernize training capabilities to enhance and sustain Navy training. These objectives are required to provide combat capable forces ready to deploy worldwide in accordance with U.S.C. Title 10, Section 5062.

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Trustees For Alaska - 13		The stated purpose of the Proposed Action is to achieve and maintain fleet readiness using the ATA to support and conduct, current, emerging, and future training activities. DEIS/OEIS at 1-2. The need for the Proposed Action is to enable the Navy to meet its statutory responsibility to organize, train, equip, and maintain combat-ready Naval forces and to successfully fulfill its current and future global mission of winning wars, deterring aggression, and maintaining freedom of the seas. Id. Nothing within-the purpose and need statement asserts that all action alternatives must include midfrequency sonar use. Training exercises without the use of mid-frequency sonar could take place and still meet the purpose and need and the set of criteria used to identify whether a possible alternative meets the purpose of and need for the Proposed Action. See DEIS/OEIS at 2-14 to 2-14; see also Letter from Nova Blazej, Manager, Environmental Review Office, EPA to Tom Clements, Public Affairs Officer, Pacific Missile Range Facility, Re: FEIS/OEIS for the Hawaiian Range Complex, June 10, 2008 (EPA recommended additional alternatives be evaluated and a more precautionary approach be taken regarding the use of mid-frequency active (MFA) sonar in training exercises due to the substantial uncertainty of these impacts on marine resources). As a result, the current two action alternatives do not represent an adequate range of reasonable alternatives.	Anti-Submarine Warfare (ASW) training remains one of the Pacific Fleet's (and the Navy's) highest priority requirements. Through NEPA and associated processes, the Navy is seeking the authorization to conduct ASW training using active sonar in the Gulf of Alaska. Since the 2008 letter that is referenced, monitoring and research during Navy training events has resulted in considerably less uncertainty regarding the use of sonar and potential impacts on marine resources. Please see response to Trustees For Alaska – 7 above regarding monitoring reports. In addition, the Navy has conducted mid-frequency and high-frequency active sonar activities for decades on training ranges on the East Coast or in Hawaii or Southern California where populations of resident beaked whales appear to thrive, with no indications of injuries to marine mammals. There have been no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis for the Gulf of Alaska demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Trustees For Alaska - 14		6. The DEIS/OEIS fails to take the requisite "hard look" analysis at the impacts associated with expended materials. The Navy estimates an extraordinary amount of spent material will result from its Preferred Alternative (Alternative 2) in the GOA. The weight of expended materials under Alternative 2 would increase to 352,000 lb(160,000 kg) per year (360-percent increase over the No Action Alternative), with the largest percentage increase from expended sonobuoys. DEIS/OEIS at 3.2-34. Navy training under Alternative 2 would deposit approximately 41lb of expended material per nm2 (5.4 kg per km2) per year over 20 percent of the TMAA. Id. The Navy bases its analysis on an assumption that training under Alternative 2 would remain consistent for a 20 year period. Id. Under this assumption, the Navy would expend approximately 3,520 tons, for a total concentration of approximately 835 lb per nm2 (110 kg per	Please see response under Susan Payne – 7.

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		km2). Id. Breaking down total tons of expended material per run in the TMAA is inappropriate because these materials are not "diluted" or spread across the entire TMAA. The Navy must identify and assess the likely levels of contaminants associated with the expended materials where those materials are to be found.	
Trustees For Alaska - 15		According to the DEIS/OEIS, expended bombs would account for most of the weight of expended materials, but the Navy asserts that the majority of this weight would be relatively inert material used as filler for practice bombs, such as concrete or sand. Id. However the DEIS/OEIS fails to provide any detail with regards to what percentage is inert.	Section 3.2 of the EIS/OEIS, Expended Materials, provides estimates of the quantities of expended materials generated annually by Navy training activities in the GOA. Energetic materials contained in training items (e.g., explosives, propellants, and pyrotechnics) are expected to be consumed (99.997%) during the normal use of the item. Thus, those portions of expended training materials remaining after use (consisting of metals, concrete, sand, etc.) are almost entirely inert. Section 3.2.2 identifies the amount of expended and hazardous material for each alternative, where the difference in the weight of expended materials and hazardous materials would be the amount of inert materials expended, such as concrete, sand, and non-hazardous metals.
Trustees For Alaska - 16		Under Alternative 2, approximately 10,300 lb (4,680 kg) per year of hazardous material would be expended (Table 3.2-19). Id. The DEIS/OEIS fails to provide a full list of the amount of each hazardous material. While the DEIS/OEIS identifies elements associated with “heavy metals," "propellants," "batteries," "explosives," and " "pyrotechnics", 'it is unclear how much of each hazardous substance is released into the environment from the training activities. Specifically, the DEIS/OEIS identifies the following hazardous substances: lead, cadmium, mercury, chromium, zinc, copper, manganese, aromatic hydrocarbons(such as benzene, toluene, and xylene), polycyclic aromatic hydrocarbons (such as naphthalene, acenaphthene, and fluoranthene),aluminum and ammonia propellant grain, arcite propellant grain, potassium hydroxide, lithium chloride, ammonium perchlorate, plastic-bonded explosives (PBX), high-explosive (HE) components, PBX-I06 explosive, PBX (AF)-108 explosive, plastic or other polymer binders, Royal Demolition Explosive (RDX, cyclotrimethylene trinitramine), High Melting Explosive (HMX, cyclotetramethylene tetranitramine), pentaerythritoltetranitrate (PETN), barium chromate, potassium perchlorate, phosphorus, titanium compounds, lead oxide, lead chromate, lead azide, fulminate of mercury,	Please see response to AMCC – 15. Also, additional information on quantities of specific potentially hazardous materials has been provided in the Final EIS/OEIS in Sections 3.2.2.5 and 3.2.2.6. With regard to regulatory compliance, the MPRSA takes precedence over the Clean Water Act in coastal waters and, as noted in the response to NRDC-98 comment, the expenditure of these materials is not “dumping” as defined under MPRSA. The London Dumping Convention specifically excludes warships from compliance.

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		molybdenum, vanadium, columbium, sodium, and nickel. The DEIS/OEIS fails to demonstrate whether the release of these materials, in these concentrations complies with the Clean Water Act, the Ocean Dumping Act, and the London Convention.	
Trustees For Alaska - 17		Trustees for Alaska highlights the following materials and lacking analysis in the DEIS/OEIS as examples of the insufficient analysis of expended materials upon the marine environment. RDX (cyclotrimethylene trinitramine), HMX (cyclotetramethylene tetranitramine) and PETN (Pentaerythritoltetranitrate) are used in bomb, missiles, blasting caps, detonation cords, etc. Most new military explosive are a mixture of RDX, HMX and plastic polymers. DEIS/OEIS at 3.3-14. However, explosives used in the training exercises (e.g. MK-82, MK-83, MK84) are older ordnances and their explosive component contain approximately 80% 2-4-6 trinitrotoluene (TNT) by mass. The toxicity of TNT in marine environments is well documented, and most studies suggest that TNT interferes with reproduction of primary producers. In high concentrations, such as those that could result from unexploded ordnances, TNT profoundly affects the reproduction capabilities of primary producers found in marine sediment. Darrar et el. "Chronic toxicity of2,4,6-trinitrotoluene to a marine polychaete and an estuarine amphipod", Environmental Toxicology and Chemistry. August 1999. The DEIS/OEIS fails to adequately assess the potential impact of TNT and quantify possible concentrations of TNT that would be deposited in the ocean.	Only a small portion of the expended training materials, by weight, would be explosives, and all but trace quantities of explosives byproducts would be consumed during their use (detonation); high-order detonations are approximately 99.997% efficient in converting explosives to non-hazardous inorganic compounds (see Page 3.2-2 of the EIS/OEIS). These trace quantities of byproducts would be quickly dispersed. Byproducts of live ordnance are addressed in Section 3.2 of the EIS/OEIS. The majority of expended materials used in the Proposed Action are heavy objects that will sink to the bottom of the water column. In items that fail to detonate (duds), the explosives and propellants usually are contained within a metal casing. Encrustation and burial in the substrate prevent leaching from expended materials. Any leaching that occurs will be diluted by ocean currents in this very large and dynamic open ocean environment. Thus, high concentrations of TNT or other explosives in marine waters surrounding expended training items are not expected.
Trustees For Alaska - 18		The DEIS/OEIS dismisses impacts associated with ammonium perchlorate on the grounds that the missiles would sink to the bottom of the ocean, where the deleterious effects would be minimized. Because of the large number of missiles being used in SINKEX (up to 28 missiles will be used), further analysis of ammonium perchlorate levels around a SINKEX area are warranted.	Ammonium perchlorate would only be present in missile propellants. Over 99 percent of propellant would be consumed during it use. Section 3.2.1.1 describes the breakdown process of propellant in the marine environment.
Trustees For Alaska - 19		The DEIS/OEIS states that copper thiocynate, a component of the batteries found in sonobuoys, "would also release cyanide, a material often toxic to marine organisms, thiocynate is tightly bound, and will form a salt or bind to bottom sediments. Therefore, the risk from thiocynate is very low." DEIS/OEIS at 3.2-14. The DEIS/OEIS insufficiently addresses the environmental impact of copper	The Navy has studied the release of copper thiocyanate from sonobuoy seawater batteries, and determined that it would achieve a peak concentration of about 0.015 microgram/liter (Department of the Navy 1993). Text describing the anticipated maximum concentration and environmental fate of copper thiocynate from sonobuoys in the marine environment has

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		thiocynate. The DEIS/OEIS contains only two sentences that address the toxicity of thiocynate. Furthermore, the DEIS/OEIS fails to cite any research that substantiates the claim that "the risk of thiocynate is very low." While the DEIS/OEIS acknowledges that cyanide would leech from batteries containing thiocynate, it fails to provide any information about expected concentrations. This is problematic, as cyanide is extremely harmful, even in low concentrations.	been added to Section 3.2.1.1
Trustees For Alaska - 20		Flourocarbons are a component of sonobuoys. The DEIS/OEIS assert that there will be no adverse effects. DEIS/OEIS at 3.2-32. Fluorocarbons are persistent organic pollutants (POPs), and are resistant to degradation. Therefore, bioaccumulation may occur, and at high concentrations fluorocarbons can interfere with biological processes. Fluorocarbons come in all varieties, some more reactive and harmful than others. The EIS fails to quantify the specific type of fluorocarbons present in sonobouys. While a small amount of fluorocarbons would be released, the DEIS/OEIS must consider the impact of fluorocarbons as POPs, which means they will remain in the marine environment for a long time. The DEIS/OEIS fails to take this into account.	Sonobuoy compasses contain FC-77 Fluorinert® Electronics Liquid. Fluorinert®, according the Material Safety Data Sheet, has insignificant toxicity to aquatic organisms (greater than 1,000 mg/L). Although the fluorinated portions of this compound are resistant to degradation, they would not be expected to concentrate in areas of the TMAA. Text describing the fluorocarbon in sonobuoys has been added to Sections 3.2.1.1 and 3.2.2.4 of the Final EIS/OEIS. For further discussion on bioaccumulation, please see response to CDFU – 9.
Trustees For Alaska - 21		Copper is also a component of sonobuoys. Like fluorocarbons, copper can come in a variety of forms. depending on the type of copper compound (copper sulfide, copper oxide, etc.) it is more or less reactive. The EIS fails to give descript examples of the type of copper that is used to house sonobuoys. Copper can be harmful to primary producers, and in high concentrations bioaccumulation will yield high amounts of copper in fish and other marine organisms. Absent this information, the DEIS/OEIS findings cannot be supported.	The Navy has studied the release of copper thiocyanate from sonobuoy seawater batteries, and determined that it would achieve a peak concentration of about 0.015 microgram/liter (Department of the Navy 1993). Release of copper thiocyanate represents the greatest concentration of copper from expended materials because it soluble. Other forms of copper in sonobuoys would be insoluble. The expected concentration of leaching copper from insoluble forms would be less than that of copper thiocyanate from sonobuoy batteries. Therefore, the concentration of leaching copper from sonobuoys would be substantially lower than EPA water criteria of 1 µg/L. Text describing the anticipated maximum concentration and environmental fate of copper thiocyanate from sonobuoys in the marine environment has been added to Section 3.2.1.1
Trustees For Alaska - 22		Tungsten is found in CIWS (Close-in Weapons Systems). The DEIS/OEIS notes that exposure to tungsten through either inhalation or ingestion poses a threat to humans and other biological organisms. DEIS/OEIS at 3.2-11. Tests performed by Mitchell et. Al in 2001 determined that	Tungsten is a primary component of the CIWS (Close-in-weapons system), which use 20-mm rounds and would not be used in a SINKEX. SINKEX would use 5-inch naval gun shells, which do not contain tungsten. However, text describing the use and fate of tungsten in the marine environment has been

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		tungsten shot ingested by ducks had "[no] deleterious health effects." Id. Recent studies by Strigul et. al. in 2005 suggest that even in extremely low concentrations, tungsten can have a measurable impact on terrestrial ecosystems. See Strigul et. al, "Effects Of Tungsten On Environmental Systems", Chemosphere, Oct. 2005. Even extremely low concentrations, tungsten reduced total peak biomass by as much as 8%. Tungsten primarily impacts primary producers, meaning that tungsten could potentially be toxic to algae and other single-celled organisms. The research cited is irrelevant to impacts associated with the Navy's proposed training exercises because it addresses the effect of tungsten-iron and tungsten-polymer shot in ducks. However, the type of activity the Navy would be practicing would deposit shards of tungsten and tungsten powder directly into the water column, potentially harming primary producers, not larger animals. Research suggests that primary producers are profoundly impacted when tungsten is introduced into an environment, even at low concentrations. The threat to larger animals arises from bioaccumulation, not the type of direct impact assessed by Mitchell et al. This is of special concern for the SINKEX test, which would use large amounts of tungsten rounds in a very small area, potentially yielding a very high concentration of tungsten in the water column. The DEIS/OEIS analysis of tungsten fails to provide expected concentrations of tungsten in the waters surrounding training of exercises such as the SINKEX. The DEIS/OEIS analysis is also-'Wholly inadequate because it fails to address impacts to primary producers and the indirect impacts to the food chain.	added to Section 3.2. For further discussion of bioaccumulation, please see response to CDFU – 9.
Trustees For Alaska - 23		Finally, with regard to specific assessment of hazardous materials, the SINKEX analysis is inadequate for several reasons. Alternative 2 would include two SINKEX training activities. DEIS/OEIS at 3.2-34. This training activity would result in 67,800 lbs of expended material annually. While Table 3.2-23 identifies the types of ordnance used, the DEIS/OEIS fails to quantify the amount of each hazardous waste deposited in the water column.	The SINKEX discussion in Section 3.2.2.6 and Table 3.2-19 contains an estimation of the weight of hazardous materials. All ordnance used during SINKEX would fall within the same types of ordnance already covered under all the alternatives. Those sections contain explanations on the types of hazardous constituents, as well as their fate in the marine environment.
Trustees For Alaska - 24		The DEIS/OEIS acknowledges that an area of hazardous materials of relatively high concentration would be created in a SINKEX, however they fail to define what those concentrations are and fail to provide any supportive analysis for the conclusion that there will be "no measurable	The EIS/OEIS discloses that SINKEXs would result in higher densities of expended materials on portions of the ocean floor compared to other training activities in the TMAA. Those densities, presented in Section 3.2.2.6 of the EIS/OEIS, are less than about 10 pounds per acre. The majority of hazardous

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		impact on the environment." Although the DEIS/OEIS acknowledges that the 67,800 lbs of expended material would likely be concentrated within an 8 nm2 (DEIS/OEIS at 3.2-33) it provides no meaningful assessment of the actual impact to the marine environment in the vicinity of the SINKEX training exercise. As a result, all DEIS/OIES conclusions regarding the SINKEX activity are unsupportable.	materials, by weight, would be heavy metals in bomb and missile casings and naval gun shell projectiles. These materials would corrode, forming a layer of corrosion that would further decrease the rate of leaching. At such densities, the environmental effects of expended items from SINKEXs would not be expected to result in concentrations harmful to marine organisms.
Trustees For Alaska - 25		The DEIS/OIES also generally diminishes the impacts associated with expended materials by stating that "[a]ssuming deposition of expended materials on 20 percent of the TMAA, the increase in density of deposited hazardous materials would be approximately 1.2 lb per nm2 (0.2 kg per km2) per year." DEIS/OEIS at 3.2-34. The DEIS/OEIS does not explain where the 20 percent assumption comes from.	The rationale for this assumption is provided under Expended Materials in Section 3.2.2.3 (page 3.2-19, 4th full paragraph). This is a conservative assumption that likely overstates the potential impacts, rather than diminishing them. It should be noted that the Navy's use of the TMAA would not be uniform. Based on Navy personnel experience, Navy training activities typically only use 20 percent of the available training area. This is a conservative assumption. Training locations in the TMAA may vary based on training requirements.
Trustees For Alaska - 26		Furthermore, as noted above, averaging out lbs/nm fails to provide a proper assessment of the impact from expended materials. Concerns over expended materials from Navy training exercises elsewhere in the United States have also drawn significant criticism from the EPA. For example, in comments submitted by EPA over the Final EIS/OEIS for the Navy's Proposed Training at the Jacksonville Range Complex in North Carolina, EPA noted that the deposition of expended materials and their accumulation over time was identified as the greatest impact of Navy training activities. April 20, 2009 Letter from Heinz Mueller, Chief NEPA Program Officer, EPA to Kelly Proctor, JAX EIS/OEIS PM; see also Oct. 27, 2008 Letter from Heinz Mueller, Chief NEPA Program Officer, EPA to Susan Admire, Naval Facilities Engineering Command, Atlantic Division Re: DEIS/OEIS for the Navy's Proposed Training at the Cherry Point Range Complex in North Carolina. The EPA raised concerns about the direct and cumulative long-term impacts to the aquatic environment associated with the accumulation of these expended materials. Id. The DEIS/OEIS fails to fully identify, discuss and analyze the direct, indirect and cumulative short-term and long-term impacts associated with discarded debris, toxins and hazardous materials. Because the DEIS/OEIS fails to properly assess concentrations of expended materials, including hazardous materials, its subsequent analyses with	Please see response to AMCC – 15. Additionally, cumulative impacts are described in Chapter 4.

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		respect to impacts on marine mammals, fish, marine organisms, etc. is invalid. Additionally, the DEIS/OEIS analysis is lacking with regards to the impacts all expended material may have upon marine organisms and the aquatic food chain into the future. If you have any questions about these comments, please do not hesitate to contact me at 276-4244 x 107. Thank you. Sincerely, Brian Litmans, Staff Attorney	
U.S. Dept of the Interior, Office of Env Policy and Compliance		United States Department of the Interior OFFICE OF THE SECRETARY Office of Environmental Policy and Compliance 1689 C Street, Room 119 Anchorage, Alaska 99501-5126 9043.1 January 25, 2010 ER09/1234 PEP/ANC Dear Mrs. Burt: The U.S. Department of the Interior has reviewed the December 2009 Draft Environmental Impact Statement for the Gulf of Alaska Navy Training Activities. We have no comments to offer at this time. Thank you for the opportunity to comment. Sincerely, Pamela Bergmann, Regional Environmental Officer – Alaska	Thank you for reviewing the document.
Lynn Wilbur - 1		To: Mrs. Amy Burt The following bulleted notes are highlights of my opposition to the United States Navy's proposal to increase training activities, introduce new training platforms, and introduce the use of mid frequency active sonar as outlined in Alternative 2, the preferred alternative in the Draft Environmental Impact Statement for the Northern Edge Training Range in the Gulf of Alaska. While I am also opposed to Alternative 1, I focus on details described in Alternative 2 for the scope of this letter.	This comment is duly noted.
Lynn Wilbur - 2		I do not believe that the Navy has taken a "Hard Look" at the impacts from its proposed training platforms on the air, water, sediments, and marine life in the Gulf of Alaska in alternatives 1 and 2 as required by the National Environmental Policy Act.	The Navy believes it has conducted a thorough analysis of potential effects from all alternatives in Chapter 3 of the Draft EIS/OEIS. The Navy does acknowledge that while additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. Chapter 4 includes

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			cumulative analysis of all past, present, and reasonably foreseen future projects by the Navy and non-Navy activities. As such, the Navy believes it is in full compliance with NEPA.
Lynn Wilbur - 3		• Air quality-Alternative 2 proposes a 123-fold increase in emissions, including greenhouse gas emissions, and it only qualifies emissions below 3000 feet. It is a well-known fact that airborne pollutants circulate in the atmosphere and sequester in circumpolar regions. The Navy claims that no mitigation is required because "Frequent precipitation probably scavenges from the air any particulates or other pollutants that might be present" (DEIS 3.1-2)-for the Navy to assume that nature will probably clean the atmosphere of pollutants discharged during training exercises is neither acceptable mitigation nor responsible stewardship of the environment.	Air Quality is addressed in Section 3.1 of the EIS/OEIS. Air pollutants above the atmospheric inversion layer (approximately 3,000 feet) were not included in the portion of the analysis that evaluated impacts on ground-level air quality; this approach is recommended by the USEPA. However, all air pollutant emissions of the alternatives were considered when addressing other aspects of air quality, such as emissions of greenhouse gases. The phenomenon of precipitation scavenging both gaseous and particulate pollutants from the atmosphere (and depositing them on the ground or in surface waters) is well documented. Mitigation measures for air quality impacts were not determined to be required (absent any scavenging of pollutants by precipitation) because the air pollutant emissions of the proposed action would not have a significant impact on air quality.
Lynn Wilbur - 4		• Expended materials-Alternative 2 proposes to release hazardous propellants, chaff, tungsten (which is toxic to marine life), fluoride compounds, 150 x the "safe" levels of hydrogen cyanide and heavy metals from missiles, bombs, sonobuoys, unmanned aircraft, etc. into the marine environment. Propellants containing PAH, benzenes, metals, and synthetic materials including PVC plastics will be released into the water column and sediments. The proposal states that these materials will "lodge in oxygen poor sediments, corrode, or become encrusted". The Navy uses environmental impact statements from other Naval training ranges, and letters written from Navy personnel to the National Marine Fisheries Service (e.g. DoN 2008c) to make this assumption; the Navy also refers to its own studies in other geographical regions of the U.S. (e.g. Wilson et al. 2002). I do not see how the Navy can correlate oxygen poor environments in the Gulf of Mexico with the marine environment in the Gulf of Alaska, especially in the absence of any references to meaningful studies undertaken in the GOA.	Oxygen concentrations in sea floor sediments are generally low, whether in the Gulf of Mexico, the Pacific Northwest, or the Gulf of Alaska. This condition is the result of a steady influx of decomposing organic material from the upper portions of the water column and the relatively slow pace of oxygen transport from the surface to the depths of the ocean.
Lynn Wilbur - 5		It is also disturbing that the Navy plans to increase its deployment of sonobuoys by 6000%; PVC and other plastic materials are part of the expendable materials list for sonobuoys.	Please see response to AMCC – 15. Additionally, please note that the Navy does not dump or discharge plastic materials from vessels, in accordance with OPNAVINST 5090.1C (DoN 2007a). Small amounts of plastics associated with training materials would enter the water because of the design of

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		Plastic compounds and other "flotsam" from the sonobuoys will be left in the ocean as well as more than 5,000 pounds of materials expended yearly from bombing and other exercises. With plastics accumulating in the North Pacific Ocean at an increasing rate, and coupled with the harmful effects that are being seen in seabirds and in the food chain, why is the Navy proposing to add to this problem? Navy personnel on hand to answer questions at the public meeting in Juneau were completely unaware that plastic pollution is a current and enormous threat to our oceans. Even if the amount of expended materials proposed in Alternative 2 is a fraction of the total amount of garbage in the oceans today, discarding more hazardous debris and plastics in our oceans and leaving them to accumulate on the bottom or become flotsam is not responsible stewardship.	training items, such as sonobuoys.
Lynn Wilbur - 6		• Fish-the Navy admits that the TMAA encompasses highly productive areas for demersal, pelagic, groundfish, and shellfish stocks. The DEIS references a dated publication (see p. 3.616) to make a case for dismissing the effects of sound and pressure on the lateral line of fish, yet a more recent review by the same author (Hastings et al. 2005 from p. 8-1) suggests that the effects of sound and pressure on the lateral line requires more research and cannot be dismissed. The proposal criticizes the "gray literature" (wording used in Hastings et al. 2005, page 4), yet relies on its own final environmental impact statements, letters, and reviews from Navy biologists to provide the basis for its stock assessments and lack of mitigation effort. Contained in Hastings et al. 2005 is a recommendation for guidelines and criteria for studying the effects of different sound sources on fish. There exist well-referenced, peer-reviewed studies using controls that clearly show the detrimental impact of high intensity sound on the sensory organs of various commercial fish species.	Please see response to CDFU – 7. In addition, the EIS/OEIS represents the best available science and most applicable science on species and distribution. The Navy has taken a hard look through its analysis and has considered competing and contradictory scientific research. Under 40 CFR §1502.22, NEPA allows for recognizing incomplete and unavailable information. Information on species density found in Tables 3.8-1 and 3.8-2 of the EIS was compiled from NMFS Stock Assessments as well as the 2009 GOALs survey and two other vessel surveys in the GOA. Therefore, density data has been generated based on available data in coordination with technical staff from NMFS.
Lynn Wilbur - 7		Is the same mitigation that is used for sea turtles and marine mammals, i.e. using on board spotters, adequate measures for protecting our fish in the Gulf of Alaska? Do we have to rely on fish declines in order to understand the effects of sonar and missile blasts of over 200 decibels on fish, as has happened in the Baltic Sea? Neither a lack of a clear understanding of impacts of sounds on fish before proceeding with the activities as put forth in Alternative 2,	As presented in detail in Chapter 3.6 and as summarized in Section 3.6.4, there may be impacts to individual fish from some activities but there are no anticipated impacts to fish populations. Given that most fish cannot hear mid-frequency sonar (which is for example within the frequency of sonar used by NOAA in acoustic trawl surveys) or high frequency sonar (like fathometers and fish-finders) it is unlikely there will be any impacts to fish from the use of sonar by the Navy in the TMAA.

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		nor an adequate mitigation plan is good stewardship.	
Lynn Wilbur - 8		• Marine mammals-Beaked whales have become a case study for effects of sonar on marine mammals, which was catalyzed by the Bahamas incident in 2000. There are three species of beaked whales in the GOA mentioned in the DEIS, as well as the critically endangered north Pacific right whale and the blue whale. In the DEIS the Navy is using abundance estimates based upon a one day survey, and generalizes results from a comprehensive and well coordinated study of several years duration of cetacean abundance off the coasts of California, Oregon, and Washington (see Appendix E-2) in order to make abundance estimates in the GOA. It is also using depth distribution measurements against the advice of the very author that it cites (see DEIS E-12).	The majority of the information the Navy used regarding marine mammals in the Gulf of Alaska comes from the National Marine Fisheries Service Stock Assessment reports as detailed in Section 3.8.2 and Appendix E of the EIS/OEIS. In 2009, the Navy funded the Gulf of Alaska Line-Transect Survey (GOALS) to better refine the density data and those survey results have been incorporated the analysis in the EIS/OEIS. Regarding use of the dive data for Cuvier's beaked whale (as described in Appendix E, page E-12), the author cautioned about the limits of the data set, not its validity or use and that dataset represents the most complete dataset and thus the best available science.
Lynn Wilbur - 9		The Navy will rely on the use of up to three onboard spotters before commencing shipboard active sonar as part of its mitigation plan; these spotters will be expected to identify and count whales by reading Navy handbooks, watching DVDs, and using a paper wheel yet the DEIS does not indicate that they will receive essential training from qualified, seasoned, and experienced marine mammal biologists. The proposal indicates that the Navy may use aerial spotters, if they are participating in the activity, if it is safe for them to do the survey, and if they have time.	One of the primary jobs of Navy lookouts is to detect and report on any anomalies in the water and therefore their purpose and training is very different than that of biologists. While they are not expected to identify marine mammals to the Species level as some biologists could, it is not a necessary component for implementation of the mitigation measures (except for the case of bow-riding dolphins). Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program that includes the NMFS-approved Marine Species Awareness Training. While the Navy is very confident that its well-trained lookouts will detect marine mammals at the surface, it does not expect that 100% of the animals present in the vicinity of training events will be detected visually or by passive acoustics. The acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided. Please see chapter 5 for a complete discussion on the Navy's mitigation measures.
Lynn Wilbur - 10		The Navy does not identify or exclude critical cetacean habitat within the TMAA and will potentially be practicing with active sonar less than 25 km from the north Pacific right whale critical habitat.	The Navy fully analyzed potential impacts to marine life, including the North Pacific right whale, in Section 3.8 (Marine Mammals) of the Draft EIS/OEIS. The analysis concludes that there is no significant impact to population levels of marine mammals. Furthermore, as stated previously, the Navy is in full compliance with the Marine Mammal Protection Act and

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			the Endangered Species Act. For more information about the Navy's compliance with these and other regulatory requirements, see Section 6 of the Draft EIS/OEIS.
Lynn Wilbur - 11		If, in the event of an unusual marine mammal stranding and/or death (USE), there will be no immediate correlation made between the sonar activity and the USE, despite scientific evidence that high intensity active sonar is harmful to whales. This means that if the National Marine Fisheries Service investigators decide that the USE has been resolved, the active sonar exercises may resume. The NMFS cannot even commit to what degree that they will be able to investigate USEs (see DEIS 5-25) and the Navy has yet to develop monitoring, unusual stranding event, or operational/communication response plans (see DEIS 5-20:24). In the SOCAL training range, three blue whales were struck by ships in the spring of 2009, yet the Navy has yet to clarify or provide details of the event, what actions were taken, and what mitigation measures were in place at the time of the ship strikes. I find the lack of study, lack of mitigation, and lack of planning highly disturbing.	Please see Appendix F regarding the potential stranding of marine mammals associated with sonar use and Section 3.8 regarding the potential effects on marine mammals. Additionally, monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS.
Lynn Wilbur - 12		I also find it disturbing that the DEIS dismisses a recommended mitigation to avoid training in the TMAA during seasonally productive times of the year, because it must "operate at any time or place to meet their training needs pursuant to Title 1O"-yet it claims that it can't train in the winter. What if the "enemy" attacks Alaska during the winter months? Why does the "any time/place" policy require that they have to train near rich and biologically productive areas, critical habitats, and marine sanctuaries, and during seasonal migrations?	In Section 2.3.2.3 of the EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Lynn Wilbur - 13		Other recommended mitigations the DEIS dismisses are as follows: -Third party observers (TPO)-The DEIS cites security reasons and a lack of military reflexes of TPOs, and the capability of its own spotters as reasons not to allow third party observers or spotters on its vessels. However, the Navy has used NOAA observers for other training projects, and has manned its own sonar-equipped vessels (i.e. the Impeccable) with contract employees. If the Navy believes that it can provide its own spotters with the same training and skill that is required of seasoned cetacean abundance surveyors, why can't the Navy provide third party observers	Third party observers are not practical as exercise participants during training events for the reasons cited in Section 5 of the DEIS. There have been special occurrences where NOAA personnel have been onboard Navy vessels on some occasions, but generally this would not be practical. There is no requirement for identification of marine mammals to species for the mitigation measures to be implemented. The monitoring plan makes use of trained observers on dedicated survey platforms or using other equipment as required to meet the research questions of the monitoring effort.

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		with response training? The DEIS goes on to contradict its claims that it can provide adequate training for its spotters by admitting that personnel are not likely to be able to differentiate cetaceans species (see DEIS 5-30)-if spotters are incapable of identifying cetaceans to species, how is the Navy supposed to implement any type of monitoring protocol, especially in the event of a marine mammal take?	
Lynn Wilbur - 14		-Halting activities after an USE-The DEIS makes the claim that training exercises in the TMAA cannot be held up by investigations of cetacean mortalities, as they take months or years. This is not so according to scientists and experts who have investigated stranding events following military sonar exercises. In fact, experts have testified that timely autopsies and tissue necropsies are critical in determining whether or not active sonar is linked to cetacean strandings and deaths. Nevertheless, timely investigations should not be a means for the Navy to deflect its responsibilities under NEPA. -Ramping up sonar-"ramping up" the intensification of active sonar so that animals have a chance to flee a sonar training event is a NMFS recommended mitigation plan (see DEIS 5-38). The Navy should be following this recommendation irrespective of their "train as they fight" policy. It seems plausible that "ramping up" can be integrated into the Navy's sonar training exercises and still allow the Navy to retain its "train as they fight" policy. The Navy must assuredly have a history of adapting and integrating other policies in their training regimes.	Please see Appendix F regarding the potential stranding of marine mammals associated with sonar use and Section 3.8 regarding the potential effects on marine mammals. As the analysis presented in Section 3.8 indicates, the use of sonar should not result in any injury or death to any marine mammals based on the best available science. Please note that the Stranding Protocol was developed in consultation with National Marine Fisheries Service stranding Program personnel who are very aware of the time it takes to investigate a stranding event. Additionally, neither NMFS nor the Navy anticipates that marine mammal stranding events or mortality will result from the use of MFA or HFA sonar during Navy exercises within the TMAA. Given, however, the potential for naturally occurring marine mammal stranding events in GOA (e.g., natural mortality), it is possible that a stranding could co-occur with a Navy exercise even though the stranding is actually unrelated to and not caused by Navy activities. Accordingly, the Navy has included requests for take, by mortality, for three beaked whale species present in the TMAA (Baird's, Cuvier's, and Stejneger's beaked whale). Mitigations that do not allow for the purpose and need of the activity to take place are not viable mitigation measures. As explained in Section 5, there is no proof that sonar ramp-up works and it negatively impacts training so is therefore not practical.
Lynn Wilbur - 15		-Enlargement of powerdown/shutdown zones-Cetacean survey experts say that it is difficult, if not impossible, to spot cetaceans or identify them to species at distances greater than 1000 yards or in anything higher than a calm sea state of Beaufort 0-1. In the absence of proper mitigation measures, such as identifying and avoiding critical habitat, avoiding seasonal migration routes, and employing more sophisticated methods of identifying marine mammals in the vicinity of an active sonar exercise, the Navy should respect the recommended 2000-yard buffer zone.	Section 5.2.1.6 from pages 5-28 through 5-41 provides detailed explanations for why some previously used or suggested measures have been eliminated from further consideration. In the first training events authorized under the Marine Mammal Protection Act, some measures were attempted in previous training events at other locations in the past (since 2006) but were subsequently shown to be clearly ineffective or having resulted in an impact to training realism. The suite of mitigation measures proposed by Navy, developed in coordination with NMFS, and presented in Chapter 5 provides the best balance between the need to be

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			precautionary in the protection of marine mammals and the needs to realistically train at sea and afford the maximum protection to all marine animals, regardless of the species.
Lynn Wilbur - 16		-Implementing vessel speed reduction-Ship strikes are an increasing cause of cetacean deaths. The Navy must evaluate and reduce the speed of its vessels, especially following active sonar exercises in order to ensure the safety and protection of marine mammals and to ensure its mission of good environmental stewardship.	The EIS/OEIS discuss the potential for mortality and injury to whales in terms of the likelihood of striking them. The EIS/OEIS describes the factors that may help to avoid collisions with all marine mammals in Section 3.8.8. Please note that an article (Annie B. Douglas, Incidence of ship strikes of large whales in Washington State, Journal of the Marine Biological Association of the United Kingdom, 2008, 88(6), 1121-1132) documents no Navy collisions and also reports that Navy has tighter and more restrictive procedures for both watchstander and reporting that typical vessel traffic in the area. Additionally, unlike Navy vessel, commercial vessels often have the bridge located at the stern and seldom have lookouts and/or the numbers of personnel on watch on the bridge as Navy vessels do.
Lynn Wilbur - 17		-Adopting mitigation measures of foreign Navies-NATO members have taken the negative impact of active sonar on cetaceans very seriously, and NATO and the European Union have implemented treaties, exclusion zones, and restrictions on the use of sonar during military training exercises. Protecting marine life must be a priority for the US Navy if it wishes to be respected to by its allies and consider itself a world leader in good environmental stewardship. Lynn Wilbur, Sitka, Alaska	The U.S. Navy did look at other mitigations, such as ones used by other Navy's. However, as presented in Chapter 5, the Navy typically operates in a Strike Group configuration where the group focuses its efforts on conducting air strikes and/or amphibious operations ashore. This requires that the Navy train to what it calls "integrated warfare" meaning that Strike Groups must conduct many different warfare areas simultaneously. These include the ability to defend itself from attacks from submarines, mines, ships, aircraft and missiles. Other nations do not possess the same integrated warfare capabilities as the United States. As a result, many foreign nations' measures are focused solely on reducing what they perceive to be impacts involving ASW. They are not required to locate training areas and position naval forces for the simultaneous and integrated warfare elements that the Navy conducts. As a result, many nations are willing to move training to areas where they believe marine mammals may not exist and do not train in the same bathymetric and littoral environments as the U.S. Navy requires for realistic training. The US Navy in conjunction with NMFS and USFWS are therefore best suited to determine what mitigation it can effectively use during its training and testing activities to mitigate harm to marine mammals while still being able to meet its operational needs to train for real-world conditions it may face. Both the Navy and NMFS agree that no significant harm

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			to marine mammal species will result from the Navy's proposed activities.

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I.3 WEBSITE COMMENTS AND RESPONSE TABLE

ID	Organization	Public Comment (Website)	Navy Response
Alaska Glacial Mud Co. - 1		Thank you for accepting my comments as a resident, small business owner and fisherman from Cordova, Alaska. I am concerned about the impacts of the proposed Navy training activities in the Gulf of Alaska on all levels of the food chain of our highly productive ocean ecosystem resulting from expended materials, both hazardous and non-hazardous, sonar and harassment/marine mammal takes that would affect every creature from microscopic zooplankton to protected whale species. I realize that our national security requires due diligence to prevent attacks and maintain a strong frontline. ... As a commercial fisherman and resident reliant on subsistence, I am concerned about the Gulf of Alaska supporting healthy populations given our current global environmental situation. To add additional ecological pressure and imbalance on a system that is already threatened by global climate change is like kicking a wounded player in the knee while they are already down for the count with a broken leg. I urge the Navy to consider Alaska and its oceans as some of the last remaining wilderness on the planet and respect it without kicking it while its vulnerable already. Thank you kindly, Lauren Padawer Cordova, Alaska	This comment is duly noted. As presented in Chapter 3 of the EIS/OEIS, the Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential effects of its proposed training activities, to include each of the concerns mentioned in the comment. The Final EIS/OEIS thoroughly analyzes the impacts of expended materials used during Navy training activities. As shown in Table 3.2-18 and 3.2-19, an estimated 352,000 lb (176 tons) of material would be expended during the training activities proposed under Alternative 2, with less than 3 percent of that material (about 5 tons) considered to be hazardous. Section 3.2 of the EIS/OEIS describes the impacts from the perspective of potentially hazardous materials such as explosives constituents. Section 3.3 describes the impacts of expended materials in terms of water and sediment quality. In addition, the existing discussion on the breakdown of hazardous materials in Environmental Consequences of Section 3.2.2, Expended Materials has been reviewed and, as appropriate, expanded. The analysis in the EIS/OEIS concludes that Expended and hazardous materials under the Proposed Action would not have a substantial effect on the marine environment.
Alaska Glacial Mud Co. - 2		I realize the public cannot be privy to information that we need to keep hidden from our enemies, however, I need more information before I am convinced that the current plans in the Gulf of Alaska are in our best national interest.	As stated in Section 1.1 of the EIS/OEIS, "The Navy's mission is to organize, train, equip, and maintain combat-ready naval forces capable of winning wars, deterring aggression, and maintaining freedom of the seas. This mission is mandated by federal law (Title 10 U.S.C. § 5062), which ensures the readiness of the United States' naval forces. The training proposed in this EIS/OEIS is needed to satisfy this requirement. Part of this training includes the use of sonar, which is currently the most effective technology for detecting and tracking quiet diesel-electric submarines. As such, it is imperative that the Navy train using this technology.
Kate Alexander - 1		While military readiness is vital to our national security, there are many things that worry me about the proposed changes to activities in the Gulf of Alaska. I believe that the explanation about the release of hazardous materials is insufficient. While total pounds under each alternative is listed, it does not spell out the specific content and amount of each hazardous material in each alternative, nor does it address any potential interaction between these substances	The total amounts of expended and hazardous materials for each alternative are summarized in Tables 3.2-10, 3.2-14, and 3.2-19. The hazardous constituents of each type of ordnance are listed in Section 3.2.1.1. The amount of each hazardous constituent is an approximation based on the best information available. The exact amount of each hazardous constituent in each piece of ordnance varies. For example (pg. 3.2-6 of the

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		with each other or other materials in the area already there as a result of current activity.	DEIS), "Based on standards established by American Society for Testing and Materials International, each steel bomb body or fin also may contain small percentages of carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, molybdenum, vanadium, columbium, or titanium, although typically present at less than 1 percent by weight." Section 3.2 identifies the total amount of hazardous materials for each ordnance type, and lists the possible hazardous constituents. It would be inappropriate to list the exact amounts hazardous constituents for all ordnance because the amounts in expended ordnance varies. The effect for all expended materials would be equivalent to the sum of individual effects because of the large area in GOA, the low areal density of expended materials, and the low percentage of hazardous materials (about 3 percent of expended materials would be considered hazardous). Cumulative effects of expended materials are addressed in Section 4.2.2.2. A cumulative impact is the sum of the Proposed Action's effects and the effects of other projects. Thus, while the combined ocean discharges of wastewater treatment plants, urban runoff, marine vessels, and other sources may result in unhealthful concentrations of marine pollutants, the Navy's expended training materials would not contribute to that impact because expended training materials contain hazardous constituents, such as residual explosives, not found in pollutants from other sources. Therefore, no significant cumulative effects would be expected for expended materials in the GOA.
Kate Alexander - 2		In fact, there appears to be no current studies that document the water or sediment quality in the area to even know what the proposed activities will be adding too.	Water and sediment quality are addressed under Water Resources in Section 3.3.1.1. Current information on pertinent water and sediment quality parameters in the TMAA are not known to be available. Some information on existing nearshore conditions drawn from nearshore samples, however, is available. This information is presented in the EIS/OEIS, and does provide some indication of the overall state of water and sediment quality in the GOA. A reasonable assumption would be that - because most pollutants are transported into the GOA from adjacent lands - sediment and water quality are higher in the central GOA than in nearshore areas, as stated in Section 3.3.1.1 of the FEIS/OEIS.
Kate Alexander - 3		While release of toxic substances may be quickly diluted in the immediate area, some toxic substances have the potential to bioaccumulate in the food chain, which in our	The bioaccumulation process is discussed in this EIS/OEIS in Section 3.8 and Section 4.2.8.2. A detailed species by species analysis of bioaccumulation potential for all possible

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		region includes humans.	contaminants is not possible with the best available scientific data at this time. Impacts from bioaccumulation present a large and complex set of variables, including marine mammal and fish occurrence in the TMAA, population size, toxicity to each individual species, and habitat types and characteristics of the TMAA. An analysis of this magnitude would overwhelm the reader with details and scientific data, without adding substantial value to the overall analysis conclusions. Due to the short-term duration and impacts of Navy training activities in the GOA, bioaccumulation impacts are not significant.
Kate Alexander - 4		Furthermore, this is the northernmost testing site, and there is no indication that there is an understanding for potential effects colder temperatures and turbulent weather (mixing) could have on these substances.	Cold water would reduce the rate of corrosion and breakdown of expended materials (Bayliss et al. 1988), resulting in lower concentrations of hazardous materials in surrounding water quality. Water currents would disperse leaching materials, and would not result in toxicity around expended materials, as discussed in Sections 3.2.1.1 and 3.2.2. Text on the effects of temperature on the rate of corrosion has been added to Section 3.2.1.1 of the Final EIS/OEIS.
Kate Alexander - 5		I do not believe there is adequate measures explained for ensuring marine mammals are protected from these increased activities. Visual observations are limited to the surface, while the ocean is obviously deep and many fish, mammals and other marine organism are dispersed throughout the entire water column. Studies show that visual monitoring only spots about 5% of marine mammals, and I do not think this success rate is enough to adequately protect endangered species.	The Navy shares your concern for marine life. As described in the EIS/OEIS, the Navy implements protective measures during its training exercises. The Navy is a leader in funding marine mammal research to better understand them and to operate with the least possible impacts. Please note that the comment referencing studies indicating "a 5% success rate" was with regard to survey protocols, were not done using Naval personnel or vessels (which have a higher height of eye for observation), and did not take into account the circumstances present during a training event such as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space. Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. The Navy does not expect 100% of the animals present in the vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness, however, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from

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			exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. As part of the Integrated Comprehensive Monitoring Program, research to measure the ability of Navy observers to detect marine mammals is also underway. Chapter 5 of the EIS/OEIS, Mitigation Measures, presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. While the Navy is very confident in its well-trained lookouts, it does not expect that 100% of the animals present in the vicinity of training events will be detected. The acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided. The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate.
Kate Alexander - 6		Furthermore, it is listed that passive sonar will be used, however this does not indicate where the organisms might be, and it does not appear that the Navy will stop activity if they detect something on the sonar, only on visual observation.	Although true, as part of the Navy's standard mitigation measures, the use of passive listening devices help to detect vocalizing marine mammals so that operators of vessels and other participants can take appropriate actions in the known presence of detected marine mammals. Please note that the Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Additionally, based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of

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			significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate.
Kate Alexander - 7		With endangered animals such as the gray whale, humpback whale, blue whales, and stellar sea lions living, feeding, or migrating through these areas, greater efforts should be included to ensure these activities have minimal impact on these species.	As described in the EIS/OEIS, the Navy implements protective measures during its training exercises. These protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate. Furthermore, it should be noted that the acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided. Please see Chapter 5 of the EIS/OEIS, Mitigation Measures, for the Navy's protective measures, which outline steps that would be implemented to protect marine mammals and Federally listed species during training events. The U.S. Navy is in full compliance with the Marine Mammal Protection Act and the Endangered Species Act. For information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.
Kate Alexander - 8		While the Navy may outline the range of their activities and the range of critical habitats surrounding the activity, mammals are not known to stop once they reach the edge of their critical habitat, and appropriate buffers should be included to ensure there is no overlap.	Yes, the Navy recognized these areas as important in establishing the boundary of the TMAA to avoid the Critical Habitat boundary established for the Stellar sea lions and the TMAA is many miles from the protective areas established for right whale, sea otter, and beluga whale; there is no designated marine mammal habitat in the TMAA by design. Additionally, please note that, at present, there is no established means for an "assessment of value" for marine mammal habitat, even if it was possible to define the value boundaries of marine mammal habitats, with any reasonable degree of certainty. The Navy acknowledges that marine mammals do not remain within critical habitats which is why they implement protective and mitigation measures and will continue to be a leader in funding marine mammal research to better understand marine species and to be able to operate with the least possible impacts.
Kate Alexander - 9		Another migrating species that is not directly addressed in the DEIS are Pacific salmon. They are fish with swim	As described in the EIS/OEIS, analysis of impacts to fish, including those with swim bladders, are found in Section 3.6 of

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		bladders, and it states that such fish have more potential to be effected by explosions.	the EIS/OEIS. As described in Section 3.6.1.4, studies have shown salmon to have poor hearing, likely due to the lack of a link between their swim bladders and their inner ear. Currently, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of fish populations. As such, the Navy is confident, and the analysis indicates, that its training activities will not impact the Pacific salmon populations off the Gulf of Alaska.
Kate Alexander - 10		The migration patterns of these fish should be better understood to ensure they will not be effected by these activities,	The Navy has analyzed effects to salmon and understand that salmon use the entire TMAA, not just specific patterns of migration. Nonetheless, the Navy is confident that its training activities will not impact salmon fisheries off the Gulf of Alaska. Analysis of impacts to salmonids is found in Section 3.6.2.3 of the EIS/OEIS.
Kate Alexander - 11		and a consideration of the economic impacts damage to salmon populations will have on the communities of the region should also be considered.	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the EIS/OEIS, the Navy is confident that its training activities will not impact salmon fisheries off the Gulf of Alaska. The EIS/OEIS describes potential economic impacts to fishing in Section 3.12.2.5. In this section, the analysis concluded that impacts would not be significant due to advanced public notification and primarily short-term duration of military activities. Additionally, no new closure or restricted areas are proposed.
Kate Alexander - 12		With the Navy sharing fishing grounds with commercial fishermen, there is a safety issue associated with undetonated weapons.	The EIS/OEIS addresses the use of live ordnance and the potential for ordnance items to not function as designed (i.e., dud) in Section 3.2 of the EIS/OEIS. Undetonated ordnance could pose a risk to fisherman, particularly those fishing by bottom trawling. If a trawl were to contact undetonated ordnance, this contact could cause the ordnance to detonate. Most likely, however, the ordnance would not detonate for the same reason it initially failed to detonate upon impact with a training target or the water surface. Based on the number of live explosive ordnance items used under Alternative 2 and the estimated failure rate, there would be approximately 0.007 undetonated explosive items per square nautical mile, or one undetonated explosive item per 140 square nautical miles. While fisherman could contact undetonated ordnance, it would be unlikely given the large area of the TMAA. Text describing potential effects on public safety from undetonated ordnance and a discussion of the potential for fishing gear to come in contact with unexploded

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			ordnance on the ocean floor has been added to the Public Health and Safety section (Section 3.14.2.3 of the FEIS/OEIS.
Kate Alexander - 13		This area is also on the edge of the ferry and tanker route, which undetonated materials would also pose a threat too.	Undetonated explosives would not pose a risk to ferries and tankers. Undetonated ordnance would sink to the sea floor, and would not come into contact with ferries or tankers traversing the ocean surface.
Kate Alexander - 14		The DEIS also underestimates the number of marine mammals and fish that will be harassed, injured and killed because it simple does not have the density estimates needed in order to make this determination. NEPA requires such information. It should be included. Citing studies on the region from 1993 is not sufficient. The world around us, including the ocean, have been changing drastically since the early 90s, and it is not sufficient to count on yesterday's science for today's decisions.	Section 3.8.2 in the DEIS discusses the density estimates: In April 2009, the Navy funded and NMFS conducted the Gulf of Alaska Line-Transect Survey (GOALS) to address the data needs for density analysis. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 for full discussion on the survey.
Kate Alexander - 15		Furthermore, there should be efforts expended to better understand the cumulative effect navy training for the past 10 years has had on the region before determining whether or not it's safe and possible to expand these efforts without significant impact to the regions resources or lifestyles.	The cumulative impacts analysis addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. Table 4-1 succinctly depicts the categories of past, present, and reasonably foreseeable future actions that affect marine populations, including past Navy training in the GOA. The EIS/OEIS analyzes in detail the effects of Navy actions on specific resources, and places those in the context of other sources of impacts.
Kate Alexander - 16		Past military activity in our region has not left a promising legacy to make me feel comfortable with future activities. Nonprofit and tribal organizations in our region are working hard to apply for money to clean up contaminated sites left over from past military activity. Until the communities of the region can feel that the Navy will be a good neighbor and respect the clean water and air that is essential to all life, I will not be in support of any increased activity in the Gulf of Alaska.	The Navy of today is very different from the military of days gone by. Your concern about “past” military activities is understood. Environmental practices as far back as 30 years ago were much different than those of today. The ocean is the Navy’s second home as well as a workplace. The Navy is sensitive to the need to protect the environment and the Navy is proud of its record of environmental stewardship, because this is the Navy’s environment too, and the Navy wants to take care of it. The Navy demonstrates that commitment by investing millions of dollars annually in programs to research impacts and the effects of its training exercises on the environment while carrying out its ongoing national defense mission.
Ellen Americus - 1		I am for the no action alternative. I do not want the Navy even in the Gulf of Alaska. I want the Navy to REDUCE their present activity in the Gulf of Alaska. Active sonar has been known to be harmful to whales. The whale population of this	As explained in Section 2.3.2 of the EIS/OEIS, a reduction in levels of training within the GOA ATAs would not support the Navy’s Purpose and Need and was therefore eliminated from further consideration. As stated in Section 1.4 of the Draft and

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		area is already endangered, suffered reduction in numbers due to the Exxon Valdez oil spill. The Gulf of Alaska is an extremely important whale migration area, and a very important marine mammal and fish habitat, especially in the months of June when the Navy is proposing their exercises. To cause the least harmful environmental effects, the Navy should consider the winter instead.	Final EIS/OEIS, the decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process. Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Furthermore, Section 3.8 (Marine Mammals) and Section 3.6 (Fish) of the EIS/OEIS thoroughly analyze impacts to both marine mammals and fish from proposed Navy training activities. The EIS/OEIS concludes that there is no significant impact to population levels for either marine mammals or fish. In Section 2.3.2.3 of the EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Ellen Americus - 2		I am against active sonar as well as missiles, torpedoes and underwater explosives. Explosives contain heavy metals, lead, uranium and other highly toxic chemicals that are known to be harmful to man and marine life. It is like bombing a national park.	Please see response to Alaska Glacial Mud Co. – 1. Additionally, please note that Depleted Uranium (DU) is not part of the proposed action for this EIS/OEIS. In February 2009, Commander Pacific Fleet directed that all Pacific Fleet ships offload all depleted uranium rounds at the earliest opportunity. This change is reflected in the Draft EIS/OEIS in Section 3.2.1.1.
Ellen Americus - 3		I am concerned about the bioaccumulation factor of these toxic chemicals in our food chain. I do not feel that war exercises are worth the cost of toxic chemicals entering in the food chain. This place is a last wild place on earth, the Navy SHOULD NOT BE ALLOWED to kill or disrupt 20 different species of marine mammals, including 7 endangered species in the Gulf of Alaska exercises. I heard one of the officers say we don't anticipate any environmental consequences, well not anticipate is not good enough. You guys better know for sure before you going messing with endangered species, in one of the last wild places and	Regarding bioaccumulation, please see response to Kate Alexander – 3. NEPA requires that Federal agencies take a hard look at potential environmental impacts based on the best available science. As such, the best available science is considered in preparation of this EIS/OEIS. As a general matter, the Navy shows consideration of the best available science when we ensure the scientific integrity of the discussions and analyses in the GOA TMAA. Specifically, this EIS/OEIS identifies methods used, references reliable scientific sources, discusses responsible opposing views, and discloses

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		leaving toxic chemicals in the food chain. Haven't we learned from mercury in the tuna. No more!!! Halibut are old fish. It takes 25 years to weigh 100 pounds. Stop the harmful bombing and missile deployment and save this vital habitat and help keep Gulf of Alaska PRISTINE.	incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR,1502.9 (b),1502.22,1502.24). Based on this standard, the U.S. Navy does not anticipate any environmental consequences; however, due to the fact that the Navy realizes that science is continuously evolving it is impossible to say definitively that there will be no consequences.
Ashore Water Taxi - 1		To Whom It May Concern, We're writing to express our strong opposition to the Navy's preferred alternative (alternative 2) for Gulf of Alaska training exercises. Thousands of endangered Humpback whales feed in this area during the summer, and the use of active sonar, not to mention all of the other exceedingly loud and potentially toxic activities proposed, will undoubtedly have a negative impact on these and many other marine mammals.	Your opposition to Alternative 2 is noted. Please see Section 3.8 regarding the recognized presence of humpback whales and other marine mammals including the analysis of affects to marine mammals from the proposed Navy training activities. As presented in Section 3.8, Navy does not anticipate any population level affect on humpback whale in the Gulf of Alaska from Navy training activities.
Ashore Water Taxi - 2		The abundance of fish in this region during the summer months supports our local fisheries, and a host of other wildlife. This area is vital to our economy and home to an abundance of other creatures, some of which (Stellar's Sea Lion) are in decline. This unique place deserves extra consideration and protection, not an increase in activities that will negatively affect it. Expanding Naval activities should not be considered. Thank you for your time, Louise Seguela, Ashore Water Taxi and Freight	Please see Section 3.7 of the EIS/OEIS for the description and analysis and potential effects on fish. The EIS/OEIS fully analyzes potential impacts to fish. The Navy is confident and the EIS/OEIS concludes that there is no significant impact to population levels for fish from Navy activities. Effects to the economy are found in Section 3.12. Navy training would not result in adverse effects to commercial shipping, commercial fishing, recreation, or tourism. Please see Sections 3.5 through 3.9 for analysis of impacts to other marine species. The Navy has concluded within each biological section that there would not be significant impacts to species populations levels as a result of Navy training.
Claudia Bain - 1		NO - I read your Fact Sheet and the SURTASS LFA High Frequency Marine Mammal Monitoring Sonar: System Description and Test & Evaluation (26 November 1999). Your fact sheet states " The results of the analysis indicate that there is the possibility for physiological effects (PTS and TTS) on marine mammals" You state in your FACT SHEET that these effects include short term or permanent loss of hearing, masking calls of mates, predators, and/or prey. You also state there will "minimal effects on the fish population". The SURTASS report states on the first page of the report that " It was the consensus of the assembled experts at these workshops that RLs of 180 dB re 1uPa(rms) marked the boundary at which higher levels cause physical harm".	LFA and MFAS should not be compared. The thresholds used to determine PTS and TTS levels were developed by NMFS, as the regulatory agency in charge of implementing MMPA, specifically for mid-frequency sound sources.
Claudia Bain - 2		The "Sonar and Marine Mammal Fact Sheet" put out by NOAA states" Most, if not all, marine mammals rely on	The science of sound in the water and its effects on marine life is evolving. The Navy conducted a thorough analysis of sonar

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		some extent of sound for a wide range of biological function...In certain conditions, mid-frequency military sonar may play a role in marine mammal strandings". Marine mammals hearing and biosonar system is their life support. The marine mammals in the PWS area have been impacted ENOUGH.	and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, our cooperating agency on this EIS/OEIS. Please note that given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding situations across the world.
Claudia Bain - 3		Alaskans have NO confidence in the integrity of your procedures or their consequences. If you MUST research your techniques go somewhere already grossly impacted by humans, like Florida.	Your concern is noted; however, please know that the Navy is not researching techniques; it is conducting training operations using established methods and equipment. Furthermore, the Navy is a leader in funding marine mammal research to better understand them and to operate with the least possible impacts. Additionally, the EIS/OEIS has been developed using the best available science, and with cooperation from the National Marine Fisheries Service (NMFS), which is responsible for the protection of marine species. Both the Navy and NMFS agree that no significant harm to marine mammal species will result from the Navy's proposed activities. As described in Section 2.3.2.1, the Navy considered, but rejected, other alternatives such as conducting this joint training at other ranges because those alternatives failed to meet the purpose of and need for the proposed action.
Claudia Bain - 4		Are you banking on there being a smaller response due to a smaller population in Alaska? Thank you for staying OUT of Alaskan waters.	This EIS/OEIS is a part of the Navy's worldwide evaluation of training activities. The Navy is conducting NEPA analyses for all areas where they are currently conducting training, including the GOA. The Navy has been conducting annual joint training exercises in the GOA for over ten years. This EIS/OEIS was announced in the Federal Register, and the Navy hopes that anyone with an interest had an opportunity to

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			provide a comment. Public involvement and/or comments are an important part of the NEPA process, regardless of the population size. Without public participation, the Navy cannot meet the spirit and intent of the NEPA process. Public comments may provide an idea, data or suggestion that may further assist the Navy's EIS process. The Navy fully supports and values public participation and involvement. All applicable comments received before developing the Final EIS/OEIS were considered and the Navy has responded to each comment in this Final EIS/OEIS. The Navy tried very hard to reach as many communities as possible by sending information to newspapers, TV stations, radio stations and libraries. As you can tell by reading this document, many comments were received.
Gail Boerwinkle		Decision on timing of training needs to be re-evaluated. Don't do the training during summer months when whales are present, fishing fleet trying to earn a living. Do training in late fall/early winter to provide minimum impact. Please re-evaluate decision. Gail Boerwinkle	In Section 2.3.2.3 of the EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Kristen Bomengen - 1		Do not increase activities in this sensitive environment. I encourage you to stick to Option One and NOT use mid-frequency active sonar.	Please see response to Ellen Americus – 1.
Kristen Bomengen - 2		It is reckless to undertake the use of active sonar that has the potential to adversely affect marine wildlife in this environment.	Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures, which were developed jointly with the National Marine Fisheries Service, are adequate.
Judith Brakel - 1	Alaska Marine Conservation Council, board member	I favor the No Action Alternative. The Navy's plans to use high frequency sonar will without doubt damage and kill a large number of marine mammals, one indicator being the estimated 450,000 "takes" per year that it will have to report under the Marine Mammals Protection Act.	Please see response to Ellen Americus – 1. This EIS/OEIS uses a method for calculating exposures to underwater sound that was developed jointly by the Navy and the National Marine Fisheries Service. This method for evaluating "takes" of marine mammals is a term used to indicate the level of harassment, either A or B, under the Marine Mammal Protection Act; the term does not reflect a marine mammal death. Of the approximately 425,000 exposures, which are estimated without consideration of the Navy's protective measures, only **one** is expected to potentially result in a marine mammal death (Level A harassment). The remainder are non-injurious Level B

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			exposures. No marine mammal deaths are expected as a result of the proposed training activities.
Judith Brakel - 2	Alaska Marine Conservation Council, board member	The Navy's proposed mitigation for sonar use is hopelessly inadequate. This includes a threshold frequency of 215 dB and depending on visually sighting marine mammals from shipboard (in daylight and dark), with the action to be taken after sighting a 1,000 yard power-down and a 200 yard shut down. Those of us who have spent time on the water know that the probability of sighting marine mammals that are present is low. Also the distances for shutting down sonar are laughably short compared to how well sound carries through the water. Elsewhere a federal court has declared these measures "woefully inadequate and ineffectual."	The thresholds used for modeling were developed in consultation with NMFS as a cooperating agency and made use of the best available science. Additionally, Navy vessels have dedicated and trained marine mammal watchstanders to look for the presence of marine mammals. Finally, last year, the U.S. Supreme Court upheld the Navy's sonar activities and mitigation measures off the coast of California. Please note that Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. The Navy does not expect 100% of the animals present in the vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness, however, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. As part of the Integrated Comprehensive Monitoring Program, research to measure the ability of Navy observers to detect marine mammals is also underway Naval vessels (which have a higher height of eye for observation), and did not take into account the circumstances present during a training event such as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space.
Judith Brakel -	Alaska Marine Conservation	Ocean acidification is increasing the transmission of sound through the water, making high frequency sonar even more	As detailed beginning in Section 4.2.1.2 and specifically beginning on page 4-11, it has been generally accepted that

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3	Council, board member	dangerous to marine mammals and likely to many fishes. Acidification as a result of the ocean absorbing more carbon dioxide from the atmosphere is a problem that is increasing rapidly in northern North Pacific waters. For reference, please see "Ocean Acidification at High Latitudes; The Bellwether" in Oceanography, vol. 22, No. 4, 2009 by Victoria Fabry et al. This paper describes the increasing acidification of the northern North Pacific, including studies by Jeremy T. Mathis of a transect from Resurrection Bay (near Seward, Alaska) out into your planned training area. Other scientific articles describe the "noisier ocean" under acidification.	the earth's temperature is warming as a result of increasing greenhouse gas emissions from human activities. Indirect secondary impacts from this global warming include sea level rise with the potential for severe impacts to coastal regions. In addition, it has been recently proposed that the continued emission of CO^2 could result in seawater is becoming more acidic as carbon dioxide from the atmosphere dissolves in the oceans, resulting in increased sound propagation in the ocean. In this regard, evaluation of the potential for CO^2 emissions to result in future increased ocean acidity further resulting in the increased propagation of underwater anthropogenic sound, remains indeterminate due to incomplete and unknown factors affecting the proposed global phenomena hypothesized. In any event, the proposed Navy actions for the Gulf of Alaska should have no net effect on the emission of greenhouse gases given the Navy is required to maintain trained forces and must undertake the necessary training activities at some location on earth, if not in the proposed TMAA. The proposed action will, therefore, have no significant additive or cumulative impact on greenhouse gas emissions, global warming, or the chemistry of the ocean as a result of any of the proposed action alternatives.
Judith Brakel - 4	Alaska Marine Conservation Council, board member	The proposed Naval use of sonar is in an area frequented by the endangered Right and Blue whales, and many other marine mammals.	The Navy fully analyzed potential impacts to marine life, including the North Pacific right whale, in section 3.8 (Marine Mammals) of the EIS/OEIS. The analysis concludes that there is no significant impact to population levels of marine mammals. Furthermore, as stated previously, the Navy is in full compliance with the Marine Mammal Protection Act and the Endangered Species Act. For more information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.

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Judith Brakel - 5	Alaska Marine Conservation Council, board member	It is also likely that many fish depend on sound and pressure signals.	The science of sound in the water and its effects on marine life is evolving. The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. The EIS/OEIS fully analyzes potential impacts to fish. As was described in Sections 3.6.1.4, fish have very limited hearing in the frequency range of Navy sonar, and the body of research indicates they are not negatively impacted by Navy sonar. As such, the Navy is confident and the EIS/OEIS concludes that there is no significant impact to population levels for fish from Navy activities.
Judith Brakel - 6	Alaska Marine Conservation Council, board member	The toxics and explosives to be used in the training will inevitably cause harm to marine creatures, from marine mammals and fish to bottom-dwelling organisms.	Please see response to Alaska Glacial Mud Co. – 1. Additionally, please note that initial releases and peak concentrations of hazardous materials from expended materials would not result in water or sediment toxicity. Hazardous materials would be quickly dispersed by ocean currents to non-toxic concentrations, and would not be expected to adversely affect marine organisms.
Judith Brakel - 7	Alaska Marine Conservation Council, board member	This is one of the richest marine areas in the world. As such, it is highly important to the economy of Alaska coastal residents, and to the whole state.	The Navy is aware that this is one of the richest marine areas in the world and has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS. Specifically, socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. To help manage competing demands and maintain public access in the GOA, the Navy conducts its offshore activities in a manner that minimizes impacts to recreation and commercial activities. Furthermore, no new closure or restricted areas are proposed.
Josh Brann - 1		Please do not allow an expansion of military training in the Gulf of Alaska. The proposed activities are known to have harmful impacts on marine wildlife, particularly the effects of sonar on marine mammals.	Please see response to Ellen Americus - 1. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process. The Navy has conducted a thorough analysis of potential effects from its proposed activities in Chapter 3 of the EIS/OEIS. The Navy does, however, recognize that the science of sound in the water and its effects on marine life is evolving. As such, sonar and at sea explosions were part of the Navy's analysis. To conduct the analysis, the Navy used the most current and best available science, with cooperation

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			from the National Marine Fisheries Service, which is responsible for the protection of marine species. Because there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment, the Navy is confident that there is little relative risk to marine mammal populations from active sonar training or any other exercises.
Josh Brann - 2		When the country is facing a poor economic climate, we should not undertake activities that are likely to have further negative consequences.	As discussed in Section 3.12, Navy training would not result in adverse effects to commercial shipping, commercial fishing, recreation, or tourism.
Josh Brann - 3		It is highly likely that the proposed activities would have a negative influence on the marine ecosystem of the Gulf of Alaska, thereby affecting the thousands of fishermen and other individuals who rely on and make their living from the bounty of the Gulf of Alaska.	The U.S. Navy has been training in the Gulf of Alaska for many years and will continue to act as a good steward of the environment as we have in the past. Similar to all other areas that the Navy trains, there is no indication that training activities have a negative impact on the health of the marine environment. In addition and as presented in Chapter 5, the Navy will implement mitigation measures to minimize potential impacts. As such, the Navy is confident, and the analysis indicates, that its training activities will not detrimentally impact the marine environment of the Gulf of Alaska.
Autumn Bryson - 1		While I believe national security is important and I support the Navy in providing good training for our armed forces, I don't believe this training should come at the expense of the health of our oceans. The EIS for the proposed increase in Navy training activities should include extensive and exhaustive studies, research and analysis on the effects of increasing training activities on marine resources before concluding that there will be no significant impacts.	The EIS/OEIS is an extensive and exhaustive study based on research and analysis of the effects of increasing training activities on marine resources. While additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science.
Autumn Bryson - 2		The marine ecosystem in the Gulf of Alaska has already felt the impacts from the Exxon Valdez Oil Spill (EVOS) and those species are still recovering. I did not see mention of the impact of the training activities on the marine species whose populations have already been compromised because of that spill.	Regarding the Exxon Valdez oil spill, it is not a specific project to be analyzed in this EIS/OEIS, as its effects are reflected in the description of baseline conditions described in the affected environment section. This is reflected in population estimates of fish, marine mammals, water quality, and expended materials. Additionally, regarding the impact of Navy training activities on marine species whose populations have already been compromised, in an study of herring (one of the few fish that can hear mid-frequency sonar) *Doksæter et al*. determined that “Military sonars of such frequencies and source levels may thus be operated in areas of overwintering herring without substantially affecting herring behavior or herring fishery” (2009:554).

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Autumn Bryson - 3		The EIS states that there will be no significant impacts from individual expended materials, but the EIS does not mention the cumulative effect of all the contaminants in the expended materials.	The hazardous constituents of each type of ordnance are listed in Section 3.2.1.1. The estimated amounts of hazardous constituents in each type of ordnance are approximations based on the best information available. The exact amounts of each hazardous constituent in each ordnance vary. Tables summarizing the total amounts of hazardous materials and the estimated densities of hazardous materials deposited in the TMAA are provided in Section 3.2, Expended Materials. The aggregate effects of all expended materials would be roughly equivalent to the sum of individual effects because of the large area in GOA, the low areal density of expended materials, and the low percentage content of hazardous constituents within the expended materials (about 3 percent of expended materials would be considered hazardous). There are no indications that, at the anticipated ambient concentrations identified in Section 3.2.1.1, these hazardous constituents of expended materials would have any synergistic or antagonistic effects. Text on the expected concentration of copper thiocyanate has been added to Section 3.2.1.1 of the Final EIS/OEIS. Cumulative effects of expended materials are addressed in Chapter 4, Section 4.2.2.2. A cumulative impact is the sum of the Proposed Action's effects and the effects of other projects. Thus, while the combined ocean discharges of wastewater treatment plants, urban runoff, marine vessels, and other sources may result in unhealthful concentrations of marine pollutants, the Navy's expended training materials would not contribute to that impact because expended training materials contain hazardous constituents, such as residual explosives, not found in pollutants from other sources. Therefore, no cumulative effects would be expected for expended materials in the GOA.
Autumn Bryson - 4		The EIS needs to spell out exactly what contaminants are in the expended materials and the total amount of each contaminant that will be released in the marine environment for each alternative.	As stated above, the exact amount of each hazardous constituent in each piece of ordnance varies. For example (pg. 3.2-6 of the Draft EIS/OEIS), "Based on standards established by American Society for Testing and Materials International, each steel bomb body or fin also may contain small percentages of carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, molybdenum, vanadium, columbium, or titanium, although typically present at less than 1 percent by weight." Section 3.2 identifies the total amount of hazardous materials for each ordnance type, and lists the possible hazardous constituents. It would be inappropriate to

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			list the exact amounts hazardous constituents for all ordnance because the amounts in expended ordnance vary. The effect for all expended materials would be equivalent to the sum of individual effects because of the large area in GOA, the low areal density of expended materials, and the low percentage of hazardous materials (about three percent of expended materials would be considered hazardous).
Autumn Bryson - 5		These contaminants may disperse once released into the water, but many toxins have the potential to bioaccumulate in the environment. Without knowing how much of each type of toxin, it is difficult to conclude that there will be no significant impact.	Regarding bioaccumulation, please see response to Kate Alexander – 3. Regarding your question about the quantities of toxins, please see response to Bryson – 4.
Autumn Bryson - 6		The people of Alaska rely on fish and marine mammals for their survival. Releasing harmful pollutants into the environment that can eventually end up in our subsistence foods may cause a multitude of detrimental health effects. This issue needs to be examined more closely in the EIS with extensive research on whether our subsistence foods will still be safe to consume at the current level of consumption taking into account that it is much higher than the rest of the country.	As stated previously, while additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. The estimation of the hazardous constituents of expended training materials is based on the best available data.
Autumn Bryson - 7		The mitigation measures used to protect marine mammals will not be able to avoid injuries and while the EIS states that the effects of the training activities may not be significant to the population as a whole they will be significant to that individual. The Navy uses passive sonar and visual inspections to detect marine life. However, after speaking with Navy representatives I learned that training activities will not cease just because a large marine mammal is in the vicinity. Passive sonar cannot pinpoint the mammal's location, thus activities will continue until the mammal is visually identified. By this time the mammal might have already entered the critical threshold where it will be behaviorally or physiologically affected.	Chapter 5 of the EIS/OEIS, Mitigation Measures, presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. While the Navy is very confident in its mitigation measures, it does not expect that 100% of the animals present in the vicinity of training events will be detected. As such, the Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. It should be noted that the acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided.
Autumn Bryson - 8		The training area selected is important habitat for a multitude of species critical to the health of our oceans. This area is at the junction of the Cook Inlet, Prince William Sound and Copper River Delta.	The Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS. There is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment.
Autumn Bryson - 9		This area has the potential to include multiple migration routes for important species. The migration patterns of these species need to be determined and the training	While several studies have indicated that the area is part of the migratory route for some salmon species and marine mammals, the details are still lacking. Given the short duration

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		activities should not occur in these areas.	of Navy activities, over a small area, there is a low probability of Navy activities coinciding with migration of salmon (or other fish) or marine mammal species. As noted in other comments, the Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential effects given the best available data in Chapter 3 of the EIS/OEIS. Please note that there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of fish, marine mammal, sea bird, or marine invertebrate populations. In addition, Chapter 5 presents details of the U.S. Navy's protective measures, outlining steps that would be implemented to protect all marine mammals and Federally listed species during training events. These protective measures would afford the maximum protection to all marine animals, regardless of the species.
Autumn Bryson - 10		The marine mammal and fish populations in the Gulf are already at critical levels. Impacts to their habitats and life cycles might disrupt this delicate balance.	Section 3.8 (Marine Mammals) and Section 3.6 (Fish) of the EIS/OEIS thoroughly analyze impacts to both marine mammals and fish from proposed Navy training activities. The EIS/OEIS concludes that there is no significant impact to population levels for either marine mammals or fish, analyzed in relation to their existing status/populations.
Autumn Bryson - 11		I was appalled to learn that there have been no long-term population studies on fish or marine mammals following Navy activities in other areas. How can one determine that there will be no effect to the populations when there have been no studies to determine that information?	The Navy has been conducting these same training events including the use of sonar for decades in the Hawaiian Islands including within the Humpback Whale National Marine Sanctuary with no apparent affects on the recovery of humpback whales. (see “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). In addition, an integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. As presented in Section 3.8, Navy does not anticipate any population level affect on humpback whale in the Gulf of Alaska from Navy training activities.
Autumn Bryson - 12		In conclusion, I don't believe the draft EIS contains enough information to determine that increasing training activities will not have a significant impact on the marine environment. Further research is needed to draw this conclusion. Therefore until adequate research is presented, the logical alternative to choose is the No Action Alternative.	The Navy feels that the EIS/OEIS contained a thorough analysis of the effects of its proposed action using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. The science of sound in the water and its effects on marine life is evolving. The Navy

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			conducted a thorough analysis of sonar and underwater detonations in the EIS/OEIS. Please note that the decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Autumn Bryson - 13		I was very disappointed in the public hearing the way we were not allowed to ask questions as a group and were funneled back and forth from room to room creating confusion.	From past experience, the Navy has concluded that the public hearing format used during the public hearings is the most conducive to effective dialogue. Additionally, all five public hearings held in Alaska exceeded NEPA requirements. Adequate time was given during each meeting to ask questions of a number of subject matter experts, on a one-on-one basis. The confusion at the Cordova hearing was caused by a misunderstanding by attendees about the hearing format. The Navy apologizes for the inconvenience.
Autumn Bryson - 14		Because this request for comments came out over the holidays I don't believe there was adequate time to review it as a lot of individuals were out of town and on vacation so I am requesting a 30 day extension.	The Navy has complied with all NEPA notification requirements under 40 C.F.R. § 1506. NEPA regulations require that agencies not allow less than 45 days for comments on a DEIS. The public review period for the Gulf of Alaska (GOA) Draft EIS/OEIS began with publication of a Notice of Availability on December 11, 2009. This notice specifically listed library repositories where the hard copy document could be viewed, and stated specifically that the document could be viewed online at the project website. In addition, specific mention of the locations where a copy of the GOA Draft EIS/OEIS could be viewed or downloaded were made in the following: - Postcards sent to potentially affected Tribes and Nations, State and Federal regulatory and government agencies, non-governmental organizations, fishing groups, and individuals - Newspaper advertisements in newspapers in Alaska - Press releases to numerous print, TV, and online media - Meeting flyers sent to community locations in Alaska. - Stakeholder letters sent to previously identified stakeholders including Tribes and Nations, Federal and State elected officials, State and Federal regulatory and government agencies, and individuals. Please note that public comments are very important to the NEPA process. The Draft EIS/OEIS was released to the public for a 45-day comment period. During this 45-day period, the Navy made extensive efforts to conduct outreach based on

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			what was learned during the scoping period and public feedback. There were ample opportunities, as well as a wide variety of options, to comment on the Gulf of Alaska Draft EIS/OEIS. The public provided comments via mail, online comments via the Gulf of Alaska EIS/OEIS website; or attendance at one of five public hearings in the state of Alaska in January 2010. At the public meetings, the public had an opportunity to publicly or privately comment in front of a court reporter or fill out a comment form, and turn it in. The Navy considered your request for an extension of the 45-day comment period. After further evaluation of the request, and the outreach efforts conducted by the Navy for the Draft EIS/OEIS, the Navy felt it was not necessary to extend the public comment period for review of the Draft EIS/OEIS.
Autumn Bryson - 15		Thank you for allowing me to comment. I hope the Final EIS contains more information and you make the right decision for what is best not only for our national security but also for the health and future health of our marine ecosystem.	This comment is duly noted. The Navy feels that the EIS/OEIS contained a thorough analysis of the effects of its proposed action. The Navy also realizes that a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. As such, new information received via comments has been thoroughly analyzed and incorporated as necessary. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Dick Callahan - 1		From Juneau Alaska January 25, 2010 23:10 local time. Stop Killing the Gulf of Alaska with Sonar 1) You know this technology will be obsolete in a few decades as all World War II technology is obsolete today.	Sonar is currently the most effective technology for detecting and tracking quiet diesel-electric submarines. As such, it is imperative that the Navy train using this technology.
Dick Callahan - 2		2) You know every other maritime nation will try to copy it if you deploy it as all admirals are jealous children, they will want their own big sounds. They will want bigger sounds.	This comment is duly noted.
Dick Callahan - 3		3) You know other countries won't care if they kill whales just as pilots of maritime countries in World War II used large whales for target practice pretending they were submarines.	This comment is duly noted.
Dick Callahan - 4		4) You know you won't be able to avoid killing whales with this sonar. You lied about doing it for decades as grad students wrote their thesis' speculating about what could be causing these mass strandings.	The Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy

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			has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations.
Dick Callahan - 5		5) You know your sonar will kill not only whales and marine mammals but also sea turtles, fish and everything else with internal air pockets.	The Navy's analysis demonstrates there is little relative risk to marine mammal populations, fish, sea turtles, or other marine life from sonar training exercises as proposed in the EIS/OEIS. The EIS/OEIS fully analyzed potential impacts to fish, sea turtles, and other marine life and habitat. As was described in Sections 3.6.1.4 and 3.7.1.1, fish and sea turtles have very limited hearing in the frequency range of Navy sonar, and the body of research indicates they are not negatively impacted by Navy sonar.
Dick Callahan - 6		In addition, you know you could displace bait fish over large areas.	The EIS/OEIS fully analyzed potential impacts to fish. As was described in Sections 3.6.1.4, fish, to include bait fish, have very limited hearing in the frequency range of Navy sonar, and the body of research indicates they are not negatively impacted by Navy sonar.
Dick Callahan - 7		6) You know you have not been honest or open with the public about secret testing you have already done here in Alaska.	This FEIS/OEIS represents the Navy's full and complete analysis of the proposed action. Should there be other activities outside the scope of the proposed action, the Navy would conduct separate NEPA analyses. Navy NEPA regulations do not preclude classified actions from NEPA review and when feasible unclassified portions are made available to the public. (32 C.F.R. §775.5).
Dick Callahan - 8		7) You know the sonar 'training' will move outside the designated area if it's deemed necessary due to weather or other factors.	The GOA TMAA was chosen because it allows the size and flexibility to move within it to ensure completion of required Navy training. The Navy is fully aware of the more sensitive areas that surround the TMAA, especially near land. The Navy is not proposing in this EIS/OEIS to train outside of the TMAA and is used to operating within specified parameters and locations.
Dick Callahan - 9		8) You know humpback whales and gray whales will be migrating through this area while you are 'training.'	As provided in Chapter 5, mitigation measures will be implemented as appropriate whenever marine mammals are detected and regardless of their location. In this manner, Navy mitigation measures will afford the maximum protection to all marine animals, regardless of the species or area. In addition, gray whales will generally be found near the coastal areas whereas the closest point of the TMAA is over 12 nautical miles from the nearest coast line, as such it is unlikely that Navy training activities would occur when these

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			whales are present.
Dick Callahan - 10		You know beaked whales live there. You know you will deafen them or kill them as you have done in the past. 9) You know how sensitive they are to sound. Your deadly sonar program is fundamentally a grotesque application of what you've learned about whale sonar, and finally:	Please see response to Callahan - 4.
Dick Callahan - 11		10) You know the United States spends more on the machines of war than the next dozen countries combined. Other countries are not the threat, you are. The future of our oceans is the future of our people. You are not saving anything. You are not protecting anything. As each generation of Americans hands the next a poorer, more degraded world they say to themselves, "Well, it was only a few animals." Now though, the oceans are so compromised by warming, acidity and overharvest that the great fisheries are gone, even our Alaska salmon fisheries would be finished in five years if we stopped dumping a billion and a half hatchery smolts into the Gulf of Alaska every year, and so therefore this deadly sonar is not operating alone but rather, is part of a synergy our people, our world, can no longer afford-for the sake of our future generations-Americans cannot continue to let you pursue Destruction To Justify Your Budget. Stop. Dick Callahan, Juneau	This comment is duly noted.
Sue Christiansen - 1		Dear President Obama, Assistant Secretary of the Navy, and others concerned: The hundreds of beached whales with ruptured ear drums off the coast of New Zealand after the US Navy completed sonar research in nearby waters is not ok. Similar incidents in California, North Carolina, Japan and Russia have all been caused by lethal soundings of sonar.	Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. The U.S. Navy is in full compliance with the Marine Mammal Protection Act and the Endangered Species Act. For information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS. Also, please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding situations across the world.

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Sue Christiansen - 2		The only other cause of bleeding around sea mammals brains with ruptured ear drums might be the explosives you propose to use again in the Gulf of Alaska training exercises.	Please see Appendix F regarding a review of marine mammal strandings. It has become evident that the "bleeding" noted in the investigations done following the Bahamas stranding event in 2000 was most likely the result of those beaked whales being on shore in distress in the tropics rather than having occurred as a direct result of any sound or pressure wave exposure.
Sue Christiansen - 3		Your environmental impact statement conveniently does not mention either of the above.	Please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report and Section 3.8 dealing with specific data on beaked whale species likely to be found in the TMAA.
Sue Christiansen - 4		What you are proposing is illegal. These marine mammals are protected by law. Though you are the Navy, you are not above the law.	The U.S. Navy is in full compliance with the Marine Mammal Protection Act and the Endangered Species Act. In addition, the National Marine Fisheries Service is a cooperating agency on this EIS/OEIS. For information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.
Sue Christiansen - 5		The Navy's Proposed Action for training in the Gulf of Alaska would also be lethal for other marine resources; fish, invertebrates, multitudes of species yet unnamed. The east coast of the United States no longer have most of the fisheries once plentiful. Please do not allow this to happen on the opposite coast. Now is the time to protect these resources. Please, DO NOT ALLOW THESE EXERCISES TO OCCUR. Sincerely, Sue Christiansen	As presented in Chapter 1, the U.S. Navy has been conducting these same activities in the Gulf of Alaska for many years, has a excellent record as a steward of the oceans, and is unaware of any potential affects that may occur to "invertebrates" or to "multitudes of species yet unnamed". As described in Section 3.6.4, the Navy's activities may result in injury or mortality to individual fish but would not result in impacts to fish populations. Effects of underwater noise on invertebrates are described in Marine Plants and Invertebrates; Sections 3.5.2.3, 3.5.2.4, and 3.5.2.5. Please see Chapter 4 with regard to cumulative impacts regarding the relative scope of Navy training activities in comparison to other more numerous activities and their known impacts.
Claddagh Enterprises and University of Alaska - 1		This testing is an absolute travesty and harmful not only to the marine creatures that travel and live in these Alaska waters, but also harmful to the human beings that depend upon marine creatures for a livelihood. Why, oh Why must our military continue to disregard the natural creatures and "practice" using live ammo, sonar, and other harmful activities. Who are we fearful of having some sort of attack on this nation that requires "practice"??	This comment is duly noted. Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. As stated previously, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment.

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Claddagh Enterprises and University of Alaska - 2		And research indicates that the earthquake in Haiti may have been caused by large sonar impulses that disturbed the ocean floor, resulting in the death of over 200,000 people and displacement of millions. Stop this madness, MADNESS, MADNESS.	This comment has been duly noted.
James Clare - 1		I am both surprised to learn about existing US Navy training in the Gulf of Alaska and seriously concerned about proposed alternatives to damage the marine environment in our area with additional training that includes strong sonar sound pollution and sinking vessels that will cause pollution of our fragile marine waters. Please do not engage in these activities.	The Navy has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS. Existing Navy training has been occurring annually and analyzed individually. Similar to all other areas that the Navy trains, there is no indication that training activities have a negative impact on the health of the marine environment. As such, the Navy is confident, and the analysis indicates, that its training activities will not impact the marine environment off the Gulf of Alaska.
James Clare - 2		Alternatively, use other alternatives that will not cause pollution or kill marine life. Thank you.	The Navy's alternatives analysis for water quality, expended materials, and affected marine resources has been analyzed within Sections 3.2-3.9. All analysis within these sections concludes that there will not be significant harm to any marine life within the GOA. In addition, Chapter 5, Mitigation, provides a detailed analysis of mitigation measures that have been implemented for each resource. Regarding alternative selection, please see response to Ellen Americus – 1.
Richard Collins - 1		Our livelihood and many of the people in communities in Prince William Sound depends on the fish that live, grow and move through the Gulf of Alaska. I am very concerned about the possible effects the Navy Training Activities could have on these resources. ... This could be too late for the rich marine life in the Gulf of Alaska, the fishermen and families depend on the resource, destruction of a food source. The Gulf of Alaska is a healthy habitat for many marine animals and should remain so.	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the EIS/OEIS, analysis of impacts to fish are found in Section 3.6 of the EIS/OEIS. There is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of fish populations. Socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics.
Richard Collins - 2		With testing, effects are often not known until after it is completed.	The proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. .In addition, the Navy believes that the proposed training will not pose a significant risk to whales, fish, and other wildlife given that these same activities have been conducted for many years in other Range Complexes with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals, fish, or wildlife at those locations. Please see the recent results supporting this as presented in training ranges monitoring

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			reports available at available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]. A integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the Draft EIS/OEIS. In addition, the Navy implements protective measures during its training events as developed with NMFS as a cooperating agency. Please see Appendix F regarding a review of sonar related stranding events. The Navy will continue to implement the monitoring and research programs where training has been occurring to determine if there are determinable impacts as a result of those activities and will do so in the TMAA associated with future training occurring there.
Jai Crapella		To whom it may concern, I understand that the Navy believes testing mid-range high frequency sonar is integral to our Nation's security but I believe there are grave concerns and consequences to using it. It's hard to even imagine how excruciating it must be to marine wildlife. The Gulf of Alaska test site is critical habitat to endangered and sensitive marine life, and the effects are not understood well enough to take such risks with the life in Gulf. Please consider Alternative 1. Thank you, Jai	Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. The Navy fully analyzed potential impacts to marine life. Additionally, given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Bridgette Cuffe - 1		I strongly oppose the dumping of hazardous materials and the use of sonar training in the Gulf of Alaska.	This comment is duly noted.
Bridgette Cuffe - 2		The gulf of Alaska is a critical habitat for thousands of species of fish, marine invertebrates, and marine mammals such as the endangered gray, humpback and blue whales. Sonar training activities would adversely affect these endangered species as well as the hundreds of non-endangered species that inhabit or migrate through this area.	Please see response to Jai Crapella above.

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Bridgette Cuffe - 3		Also, the oceans are not a garbage dump. The navy needs to find an alternative to dumping over 300,000 pounds of spent materials in the Gulf of Alaska. I support the no action alternative, which allows existing activities to continue without increasing toxic dumping or sonar activities.	Dumping is not practiced by Navy ships. Training materials are expended during the execution of authorized training activities, as such, this activity does not fall within the statutory definition of "dumping" under MPRSA. Regarding spent materials, please see response to Alaska Glacial Mud Co. - 1. Regarding alternative selection, please see response to James Clare – 2.
Laura DAmico		I urge the Navy to stop needlessly inflicting harm on Whales and other ocean life with its use of high intensity mid frequency sonar in its training exercises. Marine animals depend on the use of sound, their own "Sonar" to navigate. Blasting them with sound threatens their survival. Sonar also affects Whales directly, believed to causing strandings across the globe. Whales should not have to die for military training. The Navy can no longer ignore the unnecessary harm inflicted by this technology...I urge the Navy to immediately adopt common sense measures to keep whales safe.	Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Additionally, the science of sound in the water and its effects on marine life is evolving. The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. Also, please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding situations across the world.
Joleen Decker - 1		To Whom it may concern regarding the Navy's GOA DEIS, This news of the training expansion has not had the time it deserves to be processed by the public, and I first off request a 30-day extension.	Regarding your request for an extension, please see response to Bryson – 14.
Joleen Decker - 2		Upon the FEIS, I would also request 90-days for a proper comment period to network with all the communities that this will affect.	The Navy will comply with NEPA requirements for release of the FEIS.
Joleen Decker - 3		Our Gulf of Alaska's still-in-tact ecosystem is worth as much as homeland security. I do not oppose the Navy as a whole, and I agree that their training is important. I am however FOR the No Action plan! I do not agree with the expanded training activities in the DEIS because of the use of bombs, active sonar, ship sinkings, & hazardous waste loads	The Navy fully analyzed potential impacts from the use of expended materials, sonar, ship sinkings, and hazardous materials to marine life. The findings are in several sections of Chapter 3 of the EIS/OEIS. Regarding alternative selection, please see response to James Clare – 2.

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Joleen Decker - 4		how can the bio-accumulative affects of all these things not be real and not add up?	With regard to bioaccumulation, please see response to Kate Alexander - 3.
Joleen Decker - 5		And why do you need a permit from NOAA to "take" (which does not mean "kill") SO MANY marine mammals if there won't be such affects?	The U.S. Navy has an obligation to request an incidental take permit from NOAA in compliance with the Marine Mammal Protection Act. NOAA would grant this permit only if; "the taking will have a negligible impact on the species or stock and will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses." Regarding "takes" please see response to Judith Brakel – 1.
Joleen Decker - 6		The GOA should not be a testing ground amidst your trainings. I would request extensive research and that data work be done before you need permission for such "takings." The 'just in case' scenario of 11.7 many marine mammals passing through the ATA in 5 years, if that's how it was essentially determined while assuming that minimal behavioral affects take place, seems irresponsible. This aspect regarding the marine mammals in the midst of the training activities must be embellished	The proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. The EIS/OEIS is an extensive and exhaustive study based on research and analysis of the effects of increasing training activities on marine resources. While additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. As such, the Navy believes it has fully analyzed the potential impacts to marine life. The findings are in several sections of Chapter 3 of the EIS/OEIS.
Joleen Decker - 7		and I don't think the passive sonar that doesn't accurately detect the whale or sea turtle and the look out on deck, is enough.	This comment is duly noted. Please note that as part of the Navy's standard mitigation measures, the use of passive listening devices help to detect vocalizing marine mammals so that operators of vessels and other participants can take appropriate actions in the known presence of detected marine mammals. In addition, Navy lookouts undergo extensive training to include on-the-job instruction under supervision of an experienced lookout followed by completion of a Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. Furthermore, as noted in the EIS/OEIS in Section 5.2.1.2, all Navy surface ships participating in anti-submarine warfare exercises will have two additional personnel on watch as marine mammal lookouts. It should also be noted that the Navy routinely stands watches of 8 hrs. So, in any 24 hour period, as many as 15 fully qualified watchstanders would be on the watch. Additionally, night devices and other visual aiding devices are used.

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Joleen Decker - 8		Thank you for allowing comment, I would further input this about the DEIS: 1) it is based on research that is outdated by 10 or more years	The science of sound in the water and its effects on marine life is evolving. The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. While additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. As such, the Navy believes it has fully analyzed the potential impacts to marine life.
Joleen Decker - 9		and 2) it does not give us the answers we are wanting to be reassured that our livelihood and passion for the pristine environment we live in is left un-impacted by adverse affects, as they are virtually unknown,	The Navy believes it has fully analyzed the potential impacts to marine life. The findings are in several sections of Chapter 3 of the EIS/OEIS.
Joleen Decker - 10		3) the GOA DEIS is not specified to our region. It does not acknowledge the fact that many species, humans included (fisherman), are still in recovery from the Exxon Valdez Oil Spill (EVOS), and some are not making recovery at all, such as the Herring.	The EIS/OEIS is specifically focused on the GOA TMAA and is specific to the area as required by NEPA. Additionally, socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. Please note that the Exxon Valdez Oil Spill is not a specific project to be analyzed, as its effects are reflected in the description of baseline conditions described in the affected environment section. Furthermore, the Navy acknowledges that Pacific Herring are an ecologically and commercially significant species in the Gulf of Alaska. However, regarding the potential impact from Navy activities on the Herring, specifically sonar, the EIS/OEIS fully analyzed potential impacts. As was described in Sections 3.6.1.4, fish have very limited hearing in the frequency range of Navy sonar, and the body of research indicates they are not negatively impacted by Navy sonar. Specifically, a study of herring (one of the few fish that can hear mid-frequency sonar) *Doksæter et al*. determined that "Military sonars of such frequencies and source levels may thus be operated in areas of overwintering herring without substantially affecting herring behavior or herring fishery" (2009:554). As such, the Navy is confident and the EIS/OEIS concludes that there is no significant impact to population levels for fish, including Pacific Herring, from Navy activities.

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Joleen Decker - 11		I believe more point-source research needs to be done and the facts need to be validated.	As stated above, while additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. Additionally, the purpose of releasing the Draft EIS/OEIS to the public is to have its analysis and subsequent findings reviewed and critiqued by the public and scientific community.
Joleen Decker - 12		Our inter-connected ways of life in Alaska depend entirely on the optimally functioning ecosystem of the marine and coastal environments so that fishing, tourism, marine highway and oil transportation, and world-dependent first class research studies, to name a few, can continue while further promoting the healthy state of our ocean altogether.	This comment is duly noted.
Joleen Decker - 13		You do realize we have the last of the wild salmon runs up here. Don't you?	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. Section 3.6 (Fish) of the EIS/OEIS thoroughly analyzed impacts to Fish from proposed Navy training activities. From the analysis, the Navy is confident that its training activities will not impact salmon fisheries off the Gulf of Alaska. Furthermore, the EIS/OEIS concludes that there is no significant impact to populations of fish. Additionally, it should be noted that Threatened and Endangered salmon will be evaluated by NMFS under separate Biological Opinions as part of this process.
Zigrida Eberhardt	Centennial Library	Even though you proclaim to have regards for natural resources and the environment, I find that in the case of these training activities you are scheduling them without regard to the Breeding Season of Whales and Dolphins in the area. I am quite positive that these exercises can be rescheduled. I urge you to DO just that. It is inconceivable that wildlife is to be destroyed and killed for these exercises!	An alternative of training outside of summer in the GOA TMAA was considered in Section 2.3.2.3 of the EIS/OEIS. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further. Also, please note that the Gulf of Alaska is not a substantial breeding ground for marine mammal species.
Erika Empey - 1		Of course having the Navy train in the Gulf of Alaska is going to impact our resources! Are you kidding me????	The Navy fully analyzed potential impacts to identified resources in Chapter 3 of the EIS/OEIS. In all cases, the findings from the analysis are that no significant impacts will occur from Navy training activities.
Erika Empey - 2		Can't you guys go somewhere else where the resources and environment are already ruined???	In Section 2.3.2.3 of the EIS/OEIS, the alternative of training outside of summer in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Erika Empey - 3		My husband and I fish for a living. Having a big Naval force in the area is going to have a negative impact.	Please note that under the Proposed Action, the number of Navy vessels operating in the TMAA would be eight (to include

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			a submarine) over a maximum of 3 weeks, up to two times a year. In Section 3.6, the EIS/OEIS examined potential impacts to fish and fish habitat due to vessel movement, aircraft overflight, weapons use, expended training materials, at sea explosions, and sonar. In each case, proposed Navy training is expected to result in minimal to no harm to fish. Additionally, the EIS/OEIS described potential economic impacts to fishing in Section 3.12.2.5. In this section, the analysis concluded that impacts would not be significant due to advanced public notification and the primarily short-term duration of military activities. No new closure or restricted areas are proposed.
Erika Empey - 4		To think that the Navy is going to come in and train, and use Sonar, which is known to REALLY screw with animals and fish is pure CRAP! I do not want you in my backyard, ruining our resources! GO SOMEWHERE ELSE!	While the U.S. Navy understands your concern; however, the scientific analysis conducted in support of this EIS/OEIS that was based on the current, best available science found that the effects of Navy training, including sonar, are not significantly adverse. The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. The Navy's analysis indicates there is little relative risk to populations of marine mammals from sonar training exercises. The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Therefore, mitigation and monitoring are implemented to further reduce impacts. Also, note that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that cause adverse biological impact to marine mammal population stocks at those locations. Because there is no indication from areas where the Navy routinely trains that training activities have a negative impact on the health of the marine environment, the Navy is confident that there is little relative risk to marine mammal populations from active sonar training or any other training events. Finally, as described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.

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Erika Empey - 5		Almost all of Alaska besides Anchorage relies on fishing, why would you ruin it for us???	In Section 3.6, the EIS/OEIS examined potential impacts to fish and fish habitat due to vessel movement, aircraft overflight, weapons use, expended training materials, at sea explosions, and sonar. In each case, proposed Navy training is expected to result in minimal to no harm to fish. Additionally, the EIS/OEIS described potential economic impacts to fishing in Section 3.12.2.5. In this section, the analysis concluded that impacts would not be significant due to advanced public notification and primarily short-term duration of military activities. No new closure or restricted areas are proposed. Furthermore, to help manage competing demands and maintain public access in the GOA, the Navy conducts its offshore activities in a manner that minimizes impacts to commercial fishing.
Erika Empey - 6		I support the no action alternative. Please don't destroy the resources Alaskans depend on! It's not like we can just switch to buying everything like the lower 48. It's too expensive. This is our livelihood!	The Navy shares your concern for marine life and appreciates the resources that are so important to the Alaskan way of life. Regarding alternative selection, please see response to James Clare – 2.
Lucretia Fairchild		I support the "no action" alternative, so that existing training activities may continue, but toxic dumping will not increase; nor will the use of sonar harmful to whales and fish be allowed.	Dumping is not practiced by Navy ships. Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Analysis of impacts to fish are found in Section 3.6 of the EIS/OEIS. In summary, the EIS/OEIS examined potential impacts to fish and fish habitat due to vessel movement, aircraft overflight, weapons use, expended training materials, in-water detonations, and sonar. In each case, proposed Navy training is expected to result in minimal to no harm to fish or fish populations.
Maka Fairman - 1		As a citizen of the U.S., and of Alaska for 35 years, I am appalled at the idea the U.S. Navy has proposed. Have we no desire to save ourselves from destruction? My deceased husband was Navy, served in Vietnam, and he would agree that you are killing the sea life with this plan. Do you think you are protecting us from the terrorists? It is a terrorist	This comment is duly noted.

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		action where pure ignorance is allowed to rule a ship of fools. Do not allow this to happen. ... All military branches are surviving off the American taxpayer's back, of which I am one, and personally, I don't want my money spent on the lethal extermination of a source we all depend on to live. What is making us so mean? If you are not sure what beached whales and dolphins look like, check this out: http://www.youtube.com/watch?v=YSubC55Kl2c	
Maka Fairman - 2		Research to learn how many whales, dolphins and other valuable sea and plant life have been destroyed by these military tests, and also, the extremely toxic waste dumping that have been allowed.	The proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Additionally, dumping is not practiced by Navy ships. The hazardous constituents of each type of ordnance are listed in Section 3.2.1.1. The estimated amounts of hazardous constituents in each type of ordnance are approximations based on the best information available. The exact amounts of each hazardous constituent in each ordnance vary. Tables summarizing the total amounts of hazardous materials and the estimated densities of hazardous materials deposited in the TMAA are provided in Section 3.2, Expended Materials. The aggregate effects of all expended materials would be roughly equivalent to the sum of individual effects because of the large area in GOA, the low areal density of expended materials, and the low percentage content of hazardous constituents within the expended materials (about 3 percent of expended materials would be considered hazardous). The cumulative effects of expended and hazardous materials from the Proposed Action and other sources are addressed in Section 4.2.2.2.
Linda Feiler, Geneva Craig, and Don Miller		WE three have looked in to your actions in the past and are highly disturbed. WE are against hurting the planet, wildlife, sea life and humans in any way. It might be hard for military personnel to believe that we feel this way but we are shocked that in a time of peace you would cause such harm to our seas (us) and those of us around it and in it. Spend more hours on negotiating and instilling peaceful methods and let us try a new approach to killing everything we disagree with to see if we can make good changes on the planet. We are for the NO PLAN and wish it meant what it says. DO ABSOLUTELY NOTHING to our sea or our lives. Very Sincerely, Geneva Craig, Don Miller and Linda Feiler	The Navy shares your concern for the environment and recognizes that it has a responsibility to serve as a good steward of the natural environment. We demonstrate that commitment by investing millions of dollars annually in programs that enable us to minimize, and in some cases eliminate, the effects of our operations on the environment while carrying out our ongoing national defense mission. The fact that the Navy is a seagoing force, and that two-thirds of the world's surface is covered by water, means that many of our environmental initiatives focus on ocean stewardship and seek opportunities to control our "ecological footprint" in relation to marine life, coastal impacts, and water quality. We

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			have installed technology aboard our ships to keep plastics out of the ocean and safely manage our biodegradable waste stream. We are a world leader in marine mammal research, and are funding approximately $26 million annually in marine mammal-related research projects from fiscal years 2007-2009. We serve as the executive agent for the Department of Defense Coral Reef Task Force. Major ocean stewardship efforts can be seen in our comprehensive approach to managing effects on marine life for all of our training ranges and operating areas. These environmental planning documents are being coordinated with the National Marine Fisheries Service. In addition, the U.S. Navy has programs in place to manage threatened and endangered species on and around our installations; safely clean up past hazardous waste sites for future reuse; explore and develop new, greener technologies for equipment design and maintenance; and recycle metal, wood, and glass. Navy installations and ship's crews frequently partner with local communities on volunteer shoreline and neighborhood cleanup projects.
Laurie Ferguson - 1		Dear Mrs. Burt, Thank you for the opportunity to comment on the Navy's training exercise proposal for the Gulf of Alaska. I attended the hearing in Juneau on January 11, 2010. I strongly oppose two elements of the proposal: active sonar and ordnance. My primary concern is adverse impacts to marine mammals, particularly whales. In summer several species of whales migrate to the north Pacific after months of fasting. Whales feed only in summer in northern waters.	This comment is duly noted.
Laurie Ferguson - 2		Whales and other marine mammals have extremely sensitive hearing that is likely to be damaged by active sonar and underwater explosives. The Navy's exercises may drive whales away from their feeding areas, disrupt prey species' movements, and disturb traditional feeding and migrating patterns. They might also cause torturous sounds from which the animals may not be able to escape and which may kill the whales. I urge you to eliminate active sonar from your exercises.	The Navy shares your concern for marine life. The Navy disagrees that the proposed training and use of sonar will pose a significant risk to whales given that these same activities have been conducted for many years in other Range Complexes with no indications of any adverse impact to marine mammals, fish, or other wildlife. In addition, the Navy implements protective measures during its training events as developed with NMFS as a cooperating agency. In authorizations under the Marine Mammal Protection Act and Biological Opinions under the Endangered Species Act, NMFS has found these same training events will not pose a significant threat to marine life under their purview. The Navy will continue to implement the monitoring and research programs where training has been occurring to determine if

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			there are determinable impacts as a result of those activities. The same programs will be implemented in the TMAA during future training activities. The Navy will continue to be a leader in funding of research to better understand the potential impacts of Navy training activities and to operate with the least possible impacts while meeting training requirements.
Laurie Ferguson - 3		You have chosen an area of high marine productivity for destructive exercises. Recent studies reveal important details about the Gulf of Alaska that correlate the amount and distribution of freshwater flowing into the ocean from terrestrial sources in Alaska's temperate coastal rainforests. Rather than dissolving into salt water, freshwater eddies circulate in tight formations in several mobile locations in the Gulf. These deep anticyclonic mesoscale vortices are sources of chlorophyll and high phytoplankton production. Radio- and GPS tagged marine mammals have been tracked far into the proposed training exercise zones, likely to seek the abundance of food concentrated in the eddies. One similar study is titled "Impact of Haida Eddies on chlorophyll distribution in the Eastern Gulf of Alaska," by Crawford, Brickley, Peterson and Thomas, 2005. It explains the value of freshwater eddies in the eastern gulf but other studies show similar dense high-value feeding zones on the western side of the Gulf. I encourage you to search for more information on these eddies within the proposed training areas.	As detailed in Chapter 3 and specifically Section 3.8 with regard to marine mammals, science is still developing regarding the indicators for predicted presence of marine mammals. The use of tracking data (for example as detailed in Section 3.8.3.3 for humpback whales or Section 3.8.5.4 for fur seal) was used in determining the likely presence of marine mammals in the TMAA. The Navy's mitigation measures, as presented in Chapter 5, are implemented as applicable whenever a marine mammal is detected. Density estimates used in the marine mammal modeling and impact analysis of this EIS/OEIS factor in natural occurrences in the area. While recent studies may reveal additional details about freshwater eddies, this would not change the density estimates for the area.
Laurie Ferguson - 4		The Navy needs to reconsider its culture of continually bringing new naive staff into areas of such important natural resources. Instead, Navy experts should be encouraged to remain and increase their expertise.	This comment is duly noted.
Laurie Ferguson - 5		These exercises are destructive, expensive and wasteful.	This comment is duly noted.
Laurie Ferguson - 6		The Navy has incorrectly labeled the NO ACTION alternative. NEPA regularly uses that important phrase to mean that NO activity would occur. In the Navy's Gulf of Alaska EIS, you have determined that NO ACTION means all activities previously undertaken, minus the new plans. I object to this practice.	NEPA regulations both require analysis of a no-action alternative and provide that in situations involving ongoing activities, as with Navy actions in the GOA ATAs, that it is appropriate for the no-action alternative to reflect a baseline of ongoing actions. For EISs that study management levels of Federal assets, the no-action alternative is seen as the current management level of asset usage-in this case, status-quo as the current level of range usage. The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at

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			18027). Alternatives 1 and 2 discuss the increase from these levels. This is the approach properly taken in developing alternatives for this EIS/OEIS. (See #3 of CEQ's Forty Most Asked Questions). Given this guidance, the Navy considered all activities it has currently conducted within the GOA ATAs as its current managed level or no action. Previously, those activities have been evaluated in individually focused NEPA or E.O. 12114 documents such as the EA and/or OEAs for the Northern Edge exercise in previous years. The Navy has discussed all alternatives that were considered but eliminated in Section 2.3.2 and the consideration of the no-action alternative, alternative 1, and alternative 2 within Chapters 3 and 4 ensures the Navy's compliance under NEPA. As explained in Section 2.3.2.1 of the EIS/OEIS, relocating training activities to another location or rescheduling during a different season would not support the Navy's Purpose and Need and was therefore eliminated from further consideration. Because of the need to support the ALCOM mission, the location must be within reach of ALCOM forces. The extreme weather conditions during the non-summer season would either needlessly jeopardize participants' safety, or would be very inefficient due to likely rescheduling of numerous events not completed during bad weather.
Laurie Ferguson - 7		Three posted lookouts are inadequate for locating whales in the Gulf.	The training exercises that are part of the proposed action include multiple ships. This is notable because every single Navy ship underway has posted lookouts. All of these lookouts work in conjunction with one another to identify surface disturbances. Furthermore, Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. Navy lookouts are specifically trained to identify any surface disturbance, including marine mammals or debris, for ship safety. In addition, NMFS-approved Marine Species Awareness Training is required before every sonar exercise. In addition, as noted in the EIS/OEIS in Section 5.2.1.2, all Navy surface ships participating in anti-submarine warfare exercises will have two additional personnel on watch as marine mammal lookouts. While the Navy is very confident in its well-trained lookouts, it does not expect that 100% of the animals present in the vicinity of training events will be detected. The acoustic impact modeling estimates provided in the EIS/OEIS are not reduced

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			as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided.
Laurie Ferguson - 8		I urge you to creatively develop a better method of ascertaining submarine threats to national security than by destroying the fish, food, and marine mammals Americans treasure. Laurie Ferguson Craig Juneau, Alaska	Sonar is currently the most effective technology for detecting and tracking quiet diesel-electric submarines. As such, it is imperative that the Navy train using this technology. Section 3.8 (Marine Mammals) and Section 3.6 (Fish) thoroughly analyze impacts to both marine mammals and fish from proposed Navy training activities. The EIS/OEIS concludes that there are no significant impacts to populations of either marine mammals or fish.
Will Files		The science on our oceans is still in its infancy, but indications are that bombing and high levels of sonar are detrimental to the critters in the water. Therefore I am opposed to any use of bomb and their pollution as well as sonar use in the Gulf of Alaska.	The science of sound in the water and its effects on marine life is indeed evolving and the Navy has made use of the best available science in the analysis of potential impacts presented in the EIS/OEIS. In addition, the Navy has a requirement to train its sailors to defend this nation if called upon and there is no alternative to training in the Alaska area, as detailed in Chapters 1 and 2 of EIS/OEIS. On top of that, the Navy realizes it has an obligation to serve as a good steward of the natural environment. To meet these sometimes conflicting obligations, the Navy conducted a thorough analysis of sonar and all its activities in the EIS/OEIS, using the best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. Also see Chapter 5, which presents the mitigation measures that will be implemented to minimize impacts while maintaining the ability to conduct this vital training.

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Chris Fredell - 1		Please find another method for testing military sonar, a method that does not endanger North Pacific sea life. ... I would like to see alternatives to this proposed testing, either a different area or different testing methods that would avoid impacting the North Pacific area and its inhabitants. Thanks for your consideration. Chris Fredell	Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Furthermore, the Navy believes that all of the Navy's proposed activities were thoroughly analyzed in Chapter 3 of the EIS/OEIS. Because there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment, the Navy is confident, and the analysis indicates, that its training activities will not impact the marine environment off the Gulf of Alaska. As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.
Chris Fredell - 2		After studying the Navy's materials and attending one of the public comment session held in Alaska recently, I have concluded that the proposed test activities are too dangerous to the North Pacific's marine life systems.	This comment is duly noted.
James Gadomski		Dear Navy, Go for it and God Bless you all. My wife and I support any and all military training. Sincerely, Jim & Rose Gadomski	This comment is duly noted.
Jeanette Gann - 1		I am writing to express my opposition to the sonar testing slated for the Gulf of Alaska waters by the Navy. There is much evidence that sonar testing negatively effects whales and other marine mammals, and some effects could be fatal. One of the proposed areas for testing is adjacent to what has been determined critical habitat for right whales, an extremely endangered species.	The proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. A discussion of potential impacts to North Pacific right whales from sound sources proposed for use in the TMAA is presented in Section 3.8 of the EIS/OEIS. In addition, it should be pointed out that the Navy has conducted mid-frequency and high-frequency active sonar activities for decades with no indications of injuries to resident beaked whales at training ranges in Hawaii and Southern California or to right whales on the East Coast. There are no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Additionally, as presented in Section 3.8 and depicted on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA and not directly adjacent to it as stated in the comment.

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			Finally, it should be noted that the Navy is in full compliance with the Marine Mammal Protection Act and the Endangered Species Act. For more information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.
Jeanette Gann - 2		Many people come to Alaska for the diverse wildlife, including whale watching, and the summer-time is when the majority of whales are actively feeding in Alaska waters.	Socioeconomic impacts in regard to tourism and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. To help manage competing demands and maintain public access in the GOA, the Navy conducts its offshore activities in a manner that minimizes impacts to recreation and commercial activities.
Jeanette Gann - 3		Please reconsider your plan to test in these waters and work with the public and marine scientists to determine a more suitable area for testing that will lessen the impact on the marine environment. Thank you for your time, Jeanette Gann Juneau, Alaska	As stated previously, the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. In addition, there are mitigation and protective measures in place to lessen the impact to the marine environment. Additionally, as described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.
Adrienne Gelfand-Perine - 1		It is astounding to me to learn about the activities that are planned beginning in April that jeopardize the aquatic life as well as the water and air in the Alaskan waterways. We have too much work to do to improve our oceans and air quality without adding more devastation. ... Too many species including man will be endangered by them.	The activities will not begin until the after the Record of Decision is signed by the Secretary of the Navy, which is currently proposed no later than Winter 2010. All of the activities proposed by the Navy have been thoroughly analyzed for their potential to impact the human environment, which includes marine life, air quality, and water quality. The findings are explained in Chapter 3 of the EIS/OEIS. In summary, the proposed activities are not expected to cause any significant impacts to the environment.
Adrienne Gelfand-Perine - 2		Do NOT test sonic booms in the area.	Sonic boom testing is not part of the proposed action for this EIS/OEIS. However, throughout the course of the exercise, individual planes may attain supersonic speeds within the TMAA. This would create a sonic boom, the effects of which have been analyzed in Section 3.4 (Acoustics) and as they relate to marine mammals in Section 3.8.
Phil Gordon		No bombing, no sonar, no ordnance expended, and no hazardous materials introduced in the North Pacific by the Navy please. This area is not a human population center, but it is a rich habitat for resources and endangered species. This level of activity ignores accepted science for both endangered animals, and for other marine mammals regarding both sound, hazardous materials and sonar.	This comment is duly noted. The Navy shares your concern for marine life. As described in the EIS/OEIS, the Navy implements protective measures during its training exercises. The Navy is a leader in funding marine mammal research to better understand them and to operate with the least possible impacts. Please note that the Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using

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		Seven endangered animals are directly effected by these proposed activities. Our Navy is lavishly funded by taxpayer monies to defend our oceans and our resources, not to endanger and destroy them.	the most current and best available science, and with cooperation from the National Marine Fisheries Service, our cooperating agency on this EIS/OEIS. Regarding impacts to endangered animals, please see response to Alexander – 5.
Willow Griffin - 1		My comment is regarding the hearing on Monday, January 11th in Juneau. I am unable to attend the hearing but I do wish to weigh in on the public process. The proposed sonic booms in the Gulf of Alaska from April through October, 2010 is absolutely unacceptable.	Sonic boom testing is not part of the proposed action for this EIS/OEIS. However, throughout the course of the exercise, individual planes may attain supersonic speeds within the TMAA. This would create a sonic boom, the effects of which have been analyzed in Section 3.4 (Acoustics) and as they relate to marine mammals in Section 3.8.
Willow Griffin - 2		While it is undeniable that we need an active and capable Naval Service, there is no reason to endanger over 425,000 marine mammals, affect the migration patterns of many species for the course of five years. In five years over 10 million animals would be killed, maimed or negatively affected by this practice.	Regarding "takes" of 425,000 marine mammals, please see response to Judith Brakel – 1.
Willow Griffin - 3		Not to mention the military exercises will ultimately dump tons of toxic chemicals into an already fragile ocean.	Please see response to Judith Brakel – 6.
Willow Griffin - 4		The United States Navy must use their considerable resources to come up with other viable options for practice and research that do not have such extensive effects on a fragile ecosystem and endangered species.	It should be noted that Navy training exercises already use, to a large extent, computer-simulated training and conduct command and control exercises without operational forces (constructive training) whenever possible. However, as described in Section 2.3.2.4 of the EIS/OEIS, "Unlike live training, simulated training does not provide the requisite level of realism necessary to attain combat readiness, and cannot replicate the high-stress environment encountered during combat operations." This section and Section 1.2.1 - "Why The Navy Trains," goes further to explain the importance of live training and the current limitations of simulated training.
Robert Harrison		This proposed action is an outrage. Please do not take this action. Thank you.	This comment is duly noted.
Amy Hayes		Please do not use sonar in the Gulf of Alaska, especially during peak whale migratory periods. It is our responsibility to act with care and discrimination when endangered marine mammals may be affected by our actions.	This comment is duly noted.
James Hemming - 1		This document does not comply with the requirements of NEPA. There are no well defined mitigation measures	The Navy complies with all applicable environmental laws, including NEPA and its requirements. Furthermore, it should be noted that the U.S. Navy is in full compliance with the Marine Mammal Protection Act and the Endangered Species Act. For information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS. Chapter 5 of the EIS/OEIS, Mitigation Measures,

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			presents the U.S. Navy's protective measures to reduce impacts while conducting realistic Navy training.
James Hemming - 2		and the US Navy has not utilized the best available scientific data to assess potential impacts	Please note that the science of sound in the water and its effects on marine life is evolving. With that said, the Navy conducted a thorough analysis of sonar and underwater detonations in the EIS/OEIS, using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. Additionally, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment.
James Hemming - 3		the proposed alternatives to the project do not offer a clear and significant approach to minimize environmental impacts to living organisms in an area that is very rich in wildlife and fish resources, including threatened and endangered species. The proposed EIS for a Gulf of Alaska Navy Training Exercise should be rejected and re-written so that it complies with the National Environmental Policy Act. Sincerely, James E. Hemming	This comment is duly noted. However, please note that the purpose of an alternative is not to "offer a clear and significant approach to minimize environmental Impacts to living organisms ...." Rather, proposed alternatives are alternative actions that would meet the purpose of and need for the proposed action. Additionally, the Navy would like to point out that the broad objectives set forth in this document are both reasonable and necessary. In regard to studied alternatives, the Navy is in full compliance with NEPA. Additionally, mitigation measures are designed to minimize environmental impacts. Please see Chapter 5 of the EIS/OEIS, Mitigation Measures, presents the U.S. Navy's protective measures.
Steven Henry		Alaska and it's surrounding seas is one of the most pristine areas in the western world. PLEASE help keep it that way and refrain from military exercises in this area. Alaska is renowned and envied the world over for it's beauty, it's wildlife and it's sense of wilderness and I very much hope that it will be encouraged and nutured in such a way as to protect it's greatest asset. A military presence such as this is only going to be detrimental to Alaska's water, it's wildlife and it's reputation. Thank you. Steven Henry.	As presented in Chapter 3 of the EIS/OEIS, the Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential effects and, as presented in Chapter 4, the cumulative effects of Navy training activities added to the numerous other activities taking place in the Gulf of Alaska. Based on having conducted most of the proposed training activities over the last 10 years in Gulf of Alaska with no indications of there having been consequences for any wildlife, and with the mitigation measures presented in Chapter 5 of the EIS/OEIS, the Navy believes this history and the analysis presented in the EIS/OEIS accurately present the likely risks.
Mary Hicks - 1		I have lived on Puget Sound and witnessed the Navy's testing, dumping, and nearby spent fuel spills. In fact, one of my writing student's essays at Olympic College was published in TIME magazine about the pollution in Puget	Please note that dumping is not practiced by Navy ships. Additionally, past military practices and historical contamination sites are beyond the scope of the EIS/OEIS; they are not associated with the Proposed Action. With regard

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		Sound (PCBs were 2nd highest in the nation) off Port Orchard, next to the Naval shipyard in Bremerton. I have lived in the Arctic and was instrumental in stopping the pillaging by major oil corporations of Lake Teshukpuk, the major breeding grounds for Alaska's caribou and also breeding area for six flyways of the world. As long as I can remember since my teaching at Bremerton shipyard (communications while insulating subs) and working with engineers at Bangor (communications systems while designing one-man subs and precursors to today's drones), the Navy has been conducting tests underwater. Amid SPILLS, Alaska's marine and landed mammals' largest die-offs, stock die-offs, endangered seabirds, and a need for clean water for our nation's fisheries...not to mention the need for undisturbed sea shelf communities which are our last great breeding beds for sea life during ocean warming (and ocean acidity)....your tests continue...following protocols and directives for preparedness for war with far away nations.	to the cumulative impacts addressed in Chapter 4 of the EIS/OEIS, any contamination of bottom sediments or the water column in the GOA from these sites is reflected in the current condition of the marine environment and marine resources that inhabit the GOA.
Mary Hicks - 2		...PLEASE STOP these tests before our island nation and surrounding nations do not have a chance to survive without their meager fish diet and surviving ocean. WHEN WILL YOU STOP? USE YOUR COMPUTER MODELS AND CLean TECHNOLOGY INSTEAD OF THESE outdated, outmoded TESTS. I still have hope that you will stop (change your tests) before our ocean life dies. BE RESPONSIBLE FOR OUR ISLAND NATION THAT YOU ARE TRYING TO PROTECT AND USE YOUR NEW MODELS AND VIRTUAL TESTING.	This comment is duly noted. However, please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Please not that the EIS/OEIS discussed the value and use of synthetic training, and specifically the limits of simulation as it applies to ASW in Section 2.3.2.4. It should be noted that Navy and Marine Corps training already uses of computer-simulated training and conducts command and control exercises without operational forces (constructive training) whenever possible. However, increased simulation of ASW warfare does not meet the necessary requirements to maintain proficiency. Subsequently, simulation training as an Alternative was considered, but eliminated in Section 2.3.2.4. Additionally, Navy's training activities already incorporate substantial "mitigation" for the expenditure of training materials. Since World War II, the use of simulation technology, non-explosive training rounds, green training rounds, and retrievable targets, along with the evolution of more-efficient training programs and the overall reduction in quantities of potentially hazardous materials in expendable training materials have substantially decreased both the quantities of expended materials and their effects on the

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			environment. In keeping with its emphasis on environmental stewardship, the Navy will continue to seek appropriate opportunities to further refine its training activities and further reduce the environmental effects of expended training materials.
Mary Hicks - 3		HEAR THIS plea from someone who has witnessed polluted waterways, beaches (oil spill is still here under compact sediment..it isn't going away). WE NEED YOU TO TAKE STOCK OF OUR STOCKS and sea mammals NOW.	This comment is duly noted.
Mary Hicks - 4		PLEASE HELP shape our future and change your testing now. This is a tipping point for our ocean...protect us by being smart and modern....and compassionate about the country you want to protect. It starts with acts like these....and I believe if you cancelled these tests, recruitment would rise. TAKE STOCK OUR STOCKS NOW! Stopping these types of tests is long overdue....please stop now and show responsible leadership in protecting our island nation.	This comment is duly noted. However, please note that as stated above, the proposed action includes no testing of new weapons.
Duane Howe - 1		I was dismayed to learn that the US Navy has selected some of the most important ocean fisheries and sea mammal areas in the North Pacific to carry out training exercises. Its use of sonar in whale habitat has been an issue for many years, but despite indisputable scientific evidence of its capability to seriously traumatize whales the Navy refused to acknowledge those facts and took their case all the way to the US Supreme Court. The Court ruled narrowly in favor of the navy, but failed to acknowledge any solution other than either holding or not holding training exercises. If those were truly the only choices we would have to allow the exercises, but those are not the only choices. The navy does not adequately explain why the training has to be held in the Gulf of Alaska.	The science of sound in the water and its effects on marine life is evolving. The Navy conducted a thorough analysis of sonar effects in the EIS/OEIS, using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. The results indicate that no significant harm would come to any marine mammal population. The purpose and need of the proposed action can be found in Chapter 1 of the EIS/OEIS. In summary, in order to implement its Congressional mandates, the Navy needs to support and conduct current and emerging training activities in the GOA ATA's, including supporting joint training and ALCOM's mission, and upgrade or modernize training capabilities to enhance and sustain Navy training. These objectives are required to provide combat capable forces ready to deploy worldwide in accordance with U.S.C. Title 10, Section 5062.
Duane Howe - 2		Even if it does, the navy does not adequately explain how it will prevent damage to whales as it promised to do when the Court ruled in their favor in 2008. The Gulf of Alaska is home to or near to the habitat of several important and endangered whale species. Damage to those whales could be serious but could be avoided if adequate precautions were taken. The DEIS explanations as to how it plans to do	Please refer to Chapter 5 of the EIS/OEIS which describes the protective measures the Navy employs while conducting training. It should be noted that the Navy's protective measures, which were developed in coordination with the National Marine Fisheries Service are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history

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		that, other than to stop or reduce the use of sonar when whales are known to be in the area, are not supported scientifically. How whales will be detected from fast-moving ships is also not explained.	of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate. Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. In addition, as noted in the EIS/OEIS in Section 5.2.1.2, all Navy surface ships participating in anti-submarine warfare exercises will have two additional personnel on watch as marine mammal lookouts.
Duane Howe - 3		The issue of toxic contamination of the fisheries and marine mammal habitat is not adequately addressed either. Merely stating that the toxic residues of explosives will be rapidly disbursed does not seem to be a good scientific explanation of what can be expected. What concentration of explosive material will result, and how lethal will that concentration be to fish and sea mammals and how long will it be in that concentration? These questions need answers.	Please see response to Alaska Glacial Mud Co. – 1. Additionally, please note that the hazardous constituents of each type of ordnance are listed in Section 3.2.1.1. The amount of each hazardous constituent is an approximation based on the best information available. The exact amount of each hazardous constituent in each piece of ordnance varies. For example (pg. 3.2-6 of the EIS/OEIS), "Based on standards established by American Society for Testing and Materials International, each steel bomb body or fin also may contain small percentages of carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, molybdenum, vanadium, columbium, or titanium, although typically present at less than 1 percent by weight." Section 3.2 identifies the total amount of hazardous materials for each ordnance type, and lists the possible hazardous constituents. It would be inappropriate to list the exact amounts hazardous constituents for all ordnance because the amounts in expended ordnance varies. The effect for all expended materials would be equivalent to the sum of individual effects because of the large area in GOA, the low areal density of expended materials, and the low percentage of hazardous materials (about 3 percent of expended materials would be considered hazardous).
Duane Howe - 4		We all understand the necessity for a well-trained navy, and are willing to make certain sacrifices to obtain that objective, but there has to be some reasonable balance to it. Also, the effects of all the disturbances including noise, toxic materials and physical interferences must be scientifically supported, not just guessed at from anecdotal evidence. Defending the country is one thing, but we can't keep destroying bits and	The Navy feels that the Final EIS contains a thorough analysis of its effects of its proposed action using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. Furthermore, the Navy recognizes that the science of sound in the water and its effects on marine life is

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		pieces of it in the process. We have been nickel and dimeing our environment away for the last 150 years. We can hardly be proud of our country if it comes with a crippled environment. The military does not have a stellar record of preserving the environment in its training areas. I hope that can be changed.	evolving and that while additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. As such, the Navy believes the EIS/OEIS contains a thorough analysis of it proposed activities. The Navy will continue to fund basic research and to conduct monitoring during training events to better understand the dynamics of the ocean's species and environment.
C. Johnson	self	I think that any chance we Alaskans have to host our navy for training in our vast oceans is a great way to show our support and maybe get a little boost in our economy.	This comment is duly noted.
Juneau Charter Boat Operator's Association - 1		Dear Mrs. Burt, I represent the Juneau Charter Boat Operator's Association based out of Juneau, Alaska. We are a group of fishing and marine mammal viewing charter boat captains that operate charters in Northern S.E. Alaska from Elfin Cove to Juneau. We are concerned about the Navy's plans to do sonar (LFAS) testing in the Gulf of Alaska.	Please see specific responses to your questions below and note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Additionally, please note that only mid and high frequency sonars are proposed for use in GOA.
Juneau Charter Boat Operator's Association - 2		Following are our concerns: Since all of us provide charters that view marine mammals in their natural environment, we are concerned with your plans to exterminate 2,000,000 marine mammals during the 5 year testing phase of the sonar. Our livelihoods depend on these marine mammals for sightseeing tours. We can't even approach most marine mammals within 100 yards or we face fines and you plan on killing them. The possible effects of your testing on marine mammals include, but are not limited to: death from trauma, hearing loss, disrupting of feeding, nursing, and communication, stress, changes in distribution of marine mammals, and a decrease in marine mammal survival and productivity. All of these effects of your sonar on marine mammals have been witnessed in the past.	The Navy shares your concern for marine life. All of the possible effects described, including effects to tourism, were analyzed in the EIS/OEIS. Also, as described in the EIS/OEIS, the Navy implements protective measures during its training exercises. Regarding marine mammal "takes" please see response to Judith Brakel – 1. Additionally, please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. This report discusses the various stranding situations across the world. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate and the proposed action would not cause a significant impact.
Juneau Charter Boat Operator's Association - 3		We are concerned with your use of the sonar in the Gulf of Alaska also because we depend on salmon and halibut and other marine fish to support our businesses by taking people sport fishing aboard our boats. Both salmon and halibut migrate through the Gulf of Alaska in the area you plan on	See Section 3.6 in the EIS/OEIS regarding the evaluating the consequences to fish from the proposed training activities; please note there are no "testing" activities proposed. Also see Chapter 4 regarding cumulative impacts. Specific analysis of impacts to fish from sonar, including those with swim bladders,

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		testing the sonar. Studies have shown that intense sounds can and do damage a fish's ears, reduce the viability of eggs, harm larvae, and retard fish growth. It is also known that intense sounds can cause a fish to change its behavior and disrupt its navigation. All of our salmon pass through the Gulf of Alaska while returning to their spawning streams. We cannot afford to disrupt this valuable resource for all Alaskans. Since you have not evaluated the consequences to marine fish it is our opinion that the sonar not be used.	are found in Section 3.6 of the EIS/OEIS. As described in Section 3.6.1.4, studies have shown salmon to have poor hearing, likely due to the lack of a link between their swim bladders and their inner ear. Salmon and halibut are not likely to be able to hear the mid and high frequency sonar and sound sources proposed for use by Navy.
Juneau Charter Boat Operator's Association - 4		In closing, marine mammals and fish such as salmon and halibut are the main stay of our businesses here in S.E. Alaska. If there is even the slightest possibility that your sonar testing will disrupt marine mammals and fish behaviors or kill them even, then this sonar should not be used and another alternative should be found for your objective. Please do not use this debilitating sonar in our waters off Alaska. Sincerely, Capt. Todd Wicks President, Juneau Charter Boat Operator's Association P.O. Box 34522 Juneau, Alaska 99803 Cc: Governor Sean Parnell, Senator Dennis Egan, Representative Beth Kerttula, Representative Cathy Munoz	As explained in Sections 3.6 and 3.12 of the EIS/OEIS, the analysis supports a conclusion of no significant impacts to fisheries in Alaska. Note that sonar use by both Navy and fishing vessels have the potential to disrupt the behavior of marine mammals, but there should be no mortalities to fish or marine mammals from the use of sonar. A provided in Chapters 1 and 2 of the EIS/OEIS, there are no alternative locations supporting the Navy's purpose and need of supporting joint training and ALCOM, and so moving the proposed training was therefore eliminated from further consideration.
Kirsti Jurica - 1		The Gulf of Alaska (GoA) is high value habitat for many species essential to the Prince William Sound (PWS) ecosystem. To compromise this habitat could result in major environmental and socioeconomic impacts. Many PWS community members rely on commercial and subsistence fisheries for their economic prosperity and livelihoods. Ecological impacts from expended materials and use of sonar the Navy proposes, may have drastic effects on the communities.	The Navy conducted a thorough analysis of sonar (Section 3.8) and expended materials (Section 3.2) in the EIS/OEIS, using the best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. From the scientific analysis, the Navy believes that its training activities will not impact the ecology of the Gulf or the surrounding communities.
Kirsti Jurica - 2		The Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species in the GoA. I would say that is unacceptable. The use of sonar is of particular concern. There is no longer any scientific debate that high frequency active sonar can induce a range of adverse effects in whales and other species from significant behavioral changes to injury and death. The most widely reported and dramatic of these events are the mass strandings of beaked whales and other marine mammals that have been associated with military sonar use.	Regarding "takes" please see response to Judith Brakel – 1. Additionally, please note that the U.S. Navy has been using mid-frequency and high-frequency active sonar for decades in the Fleet concentration areas of the East Coast, Southern California, and Hawaii for decades with no known impacts to marine mammals. Given the natural variation of marine mammal locations over time within the GOA TMAA, operational variability of Navy mid-frequency active sonar operations, and the fact that there is little scientific information demonstrating broad-scale impacts that are either injurious or of significant biological impact to marine mammals, there is little relative risk to marine mammal populations from mid-

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			frequency active sonar training exercises. Also, please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding situations across the world.
Kirsti Jurica - 3		Adverse effects are not limited to stranding and death. Sonar may compromise the ability of marine mammals to navigate, find food, locate mates, avoid predators and communicate.	Navy agrees and as presented in Section 3.8.7.2, the biological framework for analysis used in the EIS/OEIS does not limit adverse effects to stranding and death.
Kirsti Jurica - 4		In the Navy's draft EIS, they attempt to mitigate sonar's harmful impacts on marine mammals by relying on a lookout visually spotting whales from the deck of its ships. The Navy would power-down sonar if a marine mammal is detected 1,000 m and shut it down if it is detected within 200 m. This scheme disregards the best available science on the significant limits of visual monitoring. Visual detection rates for marine mammals are generally low, less than 5%, even in good conditions. It also ignores the fact that sonar's impact radius can extend greater distances well beyond the horizon line. The Navy must do more to protect marine mammals from harmful impacts of sonar including protecting areas of high marine mammal abundance and essential habitat. Of course these are unknowns in the Temporary Marine Activity Area (TMAA).	Chapter 5 presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events at sea in the TMAA. As detailed in that section, the mitigation measures involve much more than a sonar "safety zone", make use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. The mitigation measures presented were developed in coordination with NMFS biologists and scientists to determine which mitigation measures would be both effective and still allow the Navy to meet its operational needs for realistic training. Please note that the comment referencing studies indicating "a 5% success rate" was with regard to survey protocols, were not done using Naval personnel or vessels (which have a higher height of eye for observation), and did not take into account the circumstances present during a training event such as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space. The Navy does not expect 100% of the animals present in the vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness, however, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern

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			California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. As part of the Integrated Comprehensive Monitoring Program, research to measure the ability of Navy observers to detect marine mammals is also underway.
Kirsti Jurica - 5		As for expended materials from training activities, the Final EIS should include a table listing the specific content and amounts of hazardous materials contained in the total amount of expended materials under each alternative. The EIS states that releasing individual expended materials would not have any significant effects on the environment, but does not mention whether the cumulative effect of adding all those contaminants into the marine environment was analyzed. Elevated concentrations of certain chemical compounds can cause adverse effects on aquatic biota including reduced survival, impaired reproduction, and reduced growth.	The hazardous constituents of each type of ordnance are listed in Section 3.2.1.1. The amount of each hazardous constituent is an approximation based on the best information available. The exact amount of each hazardous constituent in each piece of ordnance varies. For example (pg. 3.2-6 of the EIS/OEIS), "Based on standards established by American Society for Testing and Materials International, each steel bomb body or fin also may contain small percentages of carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, molybdenum, vanadium, columbium, or titanium, although typically present at less than 1 percent by weight." Section 3.2 identifies the total amount of hazardous materials for each ordnance type, and lists the possible hazardous constituents. It would be inappropriate to list the exact amounts hazardous constituents for all ordnance because the amounts in expended ordnance varies. The effect of all expended materials would be equivalent to the sum of individual effects because of the large area in GOA, the low areal density of expended materials, and the low percentage of hazardous materials (about three percent of expended materials would be considered hazardous). Cumulative effects of expended materials are addressed in Section 4.2.2.2. Fishing gear would be the most likely source of expended materials, and the majority of that expended material would not be considered hazardous. Therefore, no cumulative effects would be expected for expended materials in the GOA.
Kirsti Jurica - 6		Certain toxic substances can bio-accumulate in the food chain thus affecting all organisms.	With regard to bioaccumulation, please see response to Kate Alexander - 3.
Kirsti Jurica - 7		Before this project can even be considered, marine mammal and fish (returning salmon as well as resident bottom fish) migration patterns through the TMAA need to be studied to determine any potential effects and impacts.	The ocean migrations of salmonids was defined by Pearcy (1992) as 1) the coastal phase of juveniles, 2) the oceanic feeding phase, 3) the return of maturing fish from oceanic to coastal waters, and 4) coastal migrations of adults that terminate in freshwater. The distance traveled and the time spent in each of these phases vary greatly within and among

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			species. Pacific salmon smolts from the Pacific Northwest and California generally move up and around the West Coast of North America following the continental shelf. Juvenile salmon, including those originating from Alaska (such as the Copper River), were found to remain over the continental shelf until the start of the Aleutians before moving offshore into the Gulf of Alaska. Please see response to Ellen Americus – 3.
Kirsti Jurica - 8		Baseline water and sediment quality in the TMAA needs to be determined and evaluated in order to assess if any short term or long term effects are a result from expended materials in the TMAA. The Navy assumes ocean currents will rapidly disperse the expended materials, no mention of bio-accumulation. The Navy has no substantial evidence that this is an accurate assumption. I feel there are too many unknowns for this proposed project to risk comprising the GoA ecosystem and those livelihoods that depend on it.	Water and sediment quality are addressed under Water Resources, Section 3.3.1.1, and are based on the best information available. Information on water and sediment quality in the TMAA is limited because of its distance offshore. Existing conditions described in Section 3.3 include nearshore samples, which give a indication of the overall state of the GOA system. The estimation of the hazardous constituents of expended training materials is based on the best available data. Section 3.2, Expended Materials, lists the hazardous constituents and the estimated amount of total hazardous material for each type of expended material for all the alternatives. Ocean currents will disperse leaching materials from expended materials, and will not result in concentrations that exceed EPA water quality standards. With regard to bioaccumulation, please see response to Kate Alexander - 3.
Frances Levi		Please continue current training activities without increasing the toxins dumped or the sonar used in the area. Fish and whales are both important to the economy as food and tourism and we need to consider their wellbeing.	The Navy conducted a thorough analysis of expended materials (Section 3.2) and sonar (Section 3.8) in the EIS/OEIS, using the best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. From the scientific analysis, the Navy believes that its training activities will not impact the ecology of the Gulf or the surrounding communities.
Joy Levine - 1		This evening I attended the U.S. Navy Public Hearing for the Draft EIS regarding Gulf of Alaska Navy Training Activities that are proposed for an area the size of Iowa, in the Gulf of Alaska. Although I realize the importance of training, it is disturbing to me that the Proposed Alternative that the government is wanting, would explode approximately 144 High Explosive Bombs in an approximate period of 42 days in this area during the summer. The summer is the most plentiful time for the fish, mammals, and other sealife to migrate to Alaska with their young, when there is obviously	Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. The Navy has conducted a thorough analysis of potential harm to marine mammals from all activities, including bombing. The results indicate that no marine mammals would be injured from bombing. In addition, the Navy applies mitigation measures during bombing activities that reduce any potential effects to marine life. Mitigation measures include surveying the

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		more life in the waters of Alaska than at any other time of year. I do not want the Navy to test high explosives off the coast of Alaska in the summer. I ask that the US Navy test in the winters so that there is the least possible affect of the testing on Alaska Marine Life that would be present during the summer. Instead of 144 High Explosive Bombs, I ask that the testing NOT be done with High Explosive Bombs that have an affect on the mammals in the area.	intended target area to ensure no marine mammals are within 1,000 yards. In Section 2.3.2.3 of the EIS/OEIS, the alternative of training outside of summer in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Joy Levine - 2		The US Navy Staff informed me this evening that they will be on the lookout for whales, and when there are whales in the testing area, they will not test. Alaska, in the summer, has a great amount of migrating sea life of all kinds. I am not only concerned about the whales; I have concerns for the whales, the seals, the dolphins, the sealions, the porpoises, and other life in the waters. Big bodies like the whales are easier to see than a small seal in the water. I did not see the study by the USN of the effects that the bombs would have on the plankton and other sea life in the area, it seems to focus on whales.	The Navy apologizes, as apparently there was a miscommunication, because the Navy will not be conducting tests in the area. However, during Navy training activities and as discussed in Chapter 5, mitigation measures will be implemented as appropriate whenever marine mammals, including seals and sea lions, are detected. In this manner, the Navy's mitigation measures will afford species in all areas a reduction in impacts. The potential effects to marine plants from bombing, as well as other military expended materials, was discussed throughout Section 3.5 of the Draft EIS/OEIS.
Joy Levine - 3		I would like the US Navy to use non-explosive bombs when carrying out practices that close to the coast of Alaska, as the sea life follows the coast in their migration and travels. If there are going to be bombs exploded, I ask that there be a great degree less of the amount of bombs. It seems the Navy is proposing approximately 3 high explosions every day during the testing period of approximately 42 days. This is unacceptable to me. I ask that the USN use half the amount of non exploding bombs to lessen the impact.	This comment and subsequent requests are duly noted.
Joy Levine - 4		I realize that the US Government takes precautions to be the least harmful and have the least negative impacts on the whales, mammals, and other sea life when using and operating sonar. Unfortunately, the sonar does have a negative effect and death impact on whales and other mammals causing them to "beach" themselves. The sonar causes confusion, disorientation, and disturbs the migration of whales and other sea life, as deafening to their senses. I ask that the US Government begin using other systems besides sonar to find other submarines and ships in the ocean waters. It seems if science can see a million miles away on another planet, we have the brains to discover a new substitute for sonar. I know importance that the government places on protecting our waters and our	Sonar is currently the most effective technology for detecting and tracking quiet diesel-electric submarines. As such, it is imperative that the Navy train using this technology at this time; however, new technologies are continuously researched to improve Navy efficiency and reduce impact on the environment. Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates

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		citizens, but I think we can come up with ways of doing so without endangering the lives of so many other mammals in our oceans. I ask that you move the testing area further south, further away from the coast of Alaska, and definitely, absolutely, do not test in the summers.	there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Also, please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding situations across the world. As stated above in response to your first comment, the alternative of training outside of summer in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
William Lindow - 1		Hi - I attended the public meeting in Cordova 1-12-10. I have a couple of concerns. 1) Force Structure was not defined or explained. I cannot support something I am not informed about.	Force Structure was explained in Section 2.4.2 of the EIS/OEIS. Changes to the 'force structure', also known as the Navy's assets, are included in Alternative 1 and explained in Section 2.5 as referring to the new ships, submarines, aircraft, weapons, and training instrumentation that will be a part of the Fleet comprising the Navy's assets. New ships, submarines, and aircraft include the EA-18G (to replace the EA-6B aircraft), the Guided Missile Submarines, the P-8 Poseidon Multimission Maritime Aircraft (to replace the P-3 Orion Aircraft), the DDG-1000 Zumwalt Class Destroyer, and unmanned aerial systems. New weapon systems include Advanced Extended Echo Ranging Sonobuoy, and new training instrumentation includes a Portable Undersea Tracking Range.
William Lindow - 2		2) My primary concern is that as far as I know, there is no independent agency that will be present to observe the effects of the training on the ecosystem in the Gulf. I think it is essential to have qualified, independent observers to monitor effects of the training, given that active sonar and explosive ordnance will be used under Alternatives 1 and 2. I have not read the EIS. Perhaps my concerns are addressed there, but I felt they were not addressed at the Cordova meeting. Thank you, William Lindow	Many of the Navy's actions require regulatory permits from other governmental agencies. As part of the permitting process, these agencies conduct independent reviews of the Navy's actions. Also as part of the process, the Navy will have to do reporting and monitoring of its activities to these agencies. Additionally, in Chapter 5 of the EIS/OEIS, pages 5-30 and 5-31 provide a detailed explanation for why independent observers have been eliminated from further consideration as a mitigation measure. Please note that the suite of mitigation measures proposed by the Navy, developed in coordination with NMFS, and presented Chapter 5 provides the best balance between the need to be precautionary in the protection of marine mammals and the needs to realistically train at sea.
Nancy Lord - 1		I support the "no action" alternative. I understand that the military needs to train, but the expanded training proposed seems excessively harmful to our fish and wildlife (and the	The Navy recognizes your concern about the environment, and that is why the Navy worked closely and coordinated with the Alaska regional office of U.S. Fish and Wildlife Service and

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		economy of the affected part of Alaska, where I live) and has not been adequately assessed in the DEIS/OEIS. Just because Alaskan waters have few people living nearby and are out of sight of most Americans is no reason to allow them to be abused. The Gulf of Alaska is incredibly rich in marine life; it is also already under assault from pollution, climate change, ocean acidification, and some overfishing. It deserves a high level of protection from additional sources of stress.	the National Marine Fisheries Service, to analyze and seek permits for our activities in the ocean environment in the Gulf of Alaska. The Gulf of Alaska provides a unique and realistic training environment needed to refine and maintain skills to prepare our U.S. service members to be able to respond to a variety of scenarios including natural disasters, global conflicts and homeland defense. This EIS/OEIS is a part of the Navy's worldwide evaluation of training activities. The Navy is conducting NEPA analyses for all areas where they are currently conducting training, including Southern California, Hawaii, the Pacific Northwest, the Mariana Islands, the entire Atlantic coast, and the Gulf of Alaska. The Navy has been conducting annual joint training exercises in the GOA for over ten years. For additional information, please see response to Bain-4.
Nancy Lord - 2		I'm particularly concerned about the introduction of increased levels of hazardous materials into these waters and the use of mid-frequency sonar, which is known to harm marine mammals. The Navy has done an inadequate job of assessing cumulative impacts, available mitigation measures, and a wider range of alternatives. The "no action" alternative is the only responsible choice. Thank you for the opportunity to comment. Nancy Lord	Please note that given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. The cumulative impacts analysis addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. Table 4-1 succinctly depicts the categories of past, present, and reasonably foreseeable future actions that affect marine populations. Please also see response to Laurie Ferguson – 6.
Rob Lund		Please limit the Navy's training activities in the Gulf of Alaska by prohibiting the dumping of toxic materials and the use of harmful sonar.	Dumping is not practiced by Navy ships. Additionally, please note that given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological

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			impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Joe Macinko		Please conduct the training out past the continental shelf in thousands of fathoms of water. This particularly applies to the sinking of the derelict ships. 50 miles offshore is not sufficient distance in the gulf of Alaska. This training could be done offshore with little negative impact.	The location of the planned training area includes deep water areas. Per the Navy's general EPA permit, and as described in Section 2.6.1.1 of the EIS/OEIS, the sinking exercise training event would occur in an area that is at least 50 nautical miles from shore and in water depths greater than 6,000 feet (1,000 fathoms).
Matanuska-Susitna Borough		Thank you for the opportunity to comment on the draft EIS/OEIS. The Matanuska-Susitna Borough recently completed a Joint Land Use Study in partnership with the U.S. Army and U.S. Air Force. The high level of communication between the local military installations and the local governments has been a benefit to both the military personnel and local citizens. After reviewing the draft EIS, there do not appear to be any potential conflicts between the on-going or proposed military training activities, including the proposed force structure changes and new weapon systems with civilian land use activities within the Matanuska-Susitna Borough.	This comment is duly noted.
Molly McCoy		I support the NO action alternative, which will allow existing training activities to continue, yet it will NOT increase toxic dumping or entail the use of sonar to whales and fish. Military training for national security preparedness is vital; however, NOT at the expense of degrading water quality for our fishing industry and our marine wildlife! Molly McCoy	This comment is duly noted. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Lawrence McPhee		I am in total support of this training as a retired Senior Chief and an Alaskan. We have to train to maintain the skills needed to be successful on the modern battlefield. Freedom is not free and as a proud Navyman and Alaskan I support this training activity 100%. Go Navy!	This comment is duly noted.
Maureen Moore		I do not ever want to see the US Navy conducting sonar or explosive weapons testing anywhere within the waters of Alaska. It has been proven that sonar testing in other areas has been the precursor/ cause of the beaching of marine mammals. Autopsy reports have documented damage to the echolocation organs. Any testing that is necessary should be done hundreds of miles from shore and only after thorough searching to ensure that large pods of marine mammals are not in the area.	The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. Additionally, the U.S. Navy has conducted active sonar activities for decades with no documented proof of injuries to marine mammals. Given the natural variation of marine mammal locations over time within the GOA TMAA, operational variability of Navy active sonar

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			operations, and the fact that there is little documented scientific information demonstrating broad-scale impacts that are either injurious or of significant biological impact to marine mammals, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Appendix F provides a comprehensive discussion regarding the marine mammal stranding issue. Additionally, please see response to Ellen Americus – 3.
Lorraine Murray		January 24, 2010 Dear Sirs: The Gulf of Alaska Navy Training Activities should not be held in the Gulf of Alaska. These activities should be held in a place where the sonar impact will be on less marine life. The Gulf is a prime fishing and breeding ground, and the fisheries and marine life here are already stressed. There are also endangered marine mammals in the area, and we are contending with oil and gas spills here. We have an accelerating ocean acidification problem here, a declining fisheries problem here, and climate change related problems here and our state does not have a handle on any one of these problems. And so, I do not believe for one second that we should add one more thing to this list of problems. I respectfully request that the Navy not hold its Sonar Training Activities in the Gulf of Alaska or anywhere near our state. Sincerely, Lorraine Murray	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action. Additionally, the Navy has conducted mid-frequency and high-frequency active sonar activities for decades at training ranges on the East Coast, in Hawaii, and Southern California, where for example, populations of resident beaked whales and other marine mammals appear to thriving and fisheries remain very productive. There have been no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals or other sea life at these training ranges where the majority of at sea Navy training has been taking place for many years. As presented in Chapter 3 of the EIS/OEIS, the Navy's analysis for the Gulf of Alaska demonstrates there is little relative risk to marine species in the Gulf of Alaska. Furthermore, it should be noted that the U.S. Navy is in full compliance with the Marine Mammal Protection Act and the Endangered Species Act. For information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.
Maria Nasif - 1		The GOA (Gulf of Alaska) Temporary Maritime Activity Area (TMAA) in which the Navy plans to train extends across 42,146 square nautical miles (nm). 1) The Navy estimates an extraordinary amount of spent material will result from its Preferred Alternative (Alternative 2) in the GOA, including (1) a large increase in the weight of expended materials (352,000 lbs) and (2) 10,300 pounds of expended hazardous material. The Navy uses a quirky calculation to estimate that hazardous materials would account for approximately 1.2 lb per square nautical mile (assuming the materials are spread over 20% of the TMAA,	Please see response to Alaska Glacial Mud Co. – 1. Additionally, please note that the Navy's use of the TMAA would not be uniform. Based on Navy personnel experience, Navy training activities typically only use 20 percent of the available training area. This is a conservative assumption. Training locations in the TMAA may vary based on training requirements. Therefore, the Navy cannot predict the exact locations where training exercises would occur. It is a reasonable assumption, however, that the Navy would not conduct the same training activity in exactly the same location from year to year, and expended materials from one

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		and that ocean currents will rapidly disperse the expended materials, neither of which is a valid assumption).	training activity would not be deposited near those from a previous training activity, so that expended materials eventually would be spread over virtually the entire TMAA.
Maria Nasif - 2		2) The Navy estimates that its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 425,000 marine mammal "takes" (behavioral impacts, harassment, injury, death) every year - that's over 2.125 million takes during the course of the Marine Mammal Protection Act permit it must seek from NOAA. 3) In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the GOA.	This EIS/OEIS uses a method for calculating exposures to underwater sound that was developed jointly by the Navy and the National Marine Fisheries Service. This method for evaluating "takes" of marine mammals is a term used to indicate the level of harassment, either A or B, under the Marine Mammal Protection Act, and appears to more accurately depict the probability of a response to mid-frequency active sonar. The Navy's marine mammal density estimates take into account all of the factors that lead to biological abundance. These density estimates then informed the acoustic modeling analysis, the results of which can be found in Section 3.8.7.9 of the EIS/OEIS. The results in this section consider all of the marine mammal species present in the Gulf of Alaska and indicate that although as many as 425,000 animals could be exposed to sound from Navy sonar and explosives, only **one** is estimated to receive sound at levels that could cause some degree of permanent hearing loss.
Maria Nasif - 3		4) Nearly all of the mitigation measures that the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far-reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast-moving vessels.	Chapter 5 in the Final EIS/OEIS presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events at sea in the TMAA. As detailed in that section of the DEIS, the mitigation measures involve much more than a sonar "safety zone", make use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. The mitigation measures presented in the DEIS were developed in coordination with the National Marine Fisheries Service (NMFS) biologists and scientists to determine which mitigation measures would be both effective and still allows for the Navy to meet the operational needs for realistic training. The Navy's mitigation measures are designed to minimize impacts. It is recognized that not all marine mammals will be present at the surface and/or detected visually and not all marine mammals will be vocalizing and thus detectable by passive acoustics. The mitigation measures are effective at limiting some marine mammals exposures to high levels of sound, just as they were designed to do.

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Maria Nasif - 4		5) The Navy has not proposed to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife.	The boundaries of the TMAA were adjusted to avoid the designated Critical Habitat for Steller sea lions. As presented in Section 3.8 and depicted on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA and not directly adjacent to it as stated in the comment. In addition, gray whales and harbor porpoise will generally be found near the coastal areas whereas the closest point of the TMAA is over 12 nautical miles from the nearest coast line. While blue whales could be present in the TMAA, the best available science indicates their presence will be rare in the area and it is therefore unlikely that Navy training activities would occur when they are present.
Maria Nasif - 5		6) For example, no protection areas are proposed for harbor porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the TMAA; for endangered humpback whales and blue whales, which gather to feed in the TMAA; for the critically endangered North Pacific right whale, who's critical habitat is directly adjacent to the TMAA; or for any other species or habitat.	As provided in Section 5, mitigation measures will be implemented as appropriate whenever marine mammals are detected and regardless of their location. In this manner, Navy mitigation measures will afford the maximum protection to all marine animals, regardless of the species or area. In addition, the concept of geographical limitations is inconsistent with the requirements for training in the TMAA. Seamounts or areas of bathymetric relief are often used by submarines to hide or mask their presence, requiring the need to train in that complex ocean environment. If the Navy were restricted from training near sea mounts or areas of bathymetric relief, they may be unable to do so when faced with an actual threat. It would be impractical to train while attempting to avoid all areas of "high bathymetric relief", however that would be defined, and would certainly remove the realism needed for accomplishing this critical training.
Maria Nasif - 6		7) The Navy does not properly analyze environmental impacts. For instance, it completely disregards the serious impacts its sonar training will have on the critically endangered North Pacific right whales, whose critical habitat is only 12 nautical miles from the TMAA or the endangered gray whales, which migrate through the TMAA.	As presented in Section 3.8 and depicted on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA. In addition, gray whales have largely recovered, are no longer considered endangered, and will generally be found near the coastal areas whereas the closest point of the TMAA is over 12 nautical miles from the nearest coast line.
Maria Nasif - 7		8) The Navy underestimates the number of marine mammals (and fish) that will be harassed, injured and killed because it simply does not have the density estimates needed in order to accurately make this determination. The National Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. The simple assertion that "no information	Section 3.8.2 in the EIS/OEIS discusses the density estimates: In April 2009, the Navy funded and NMFS conducted the Gulf of Alaska Line-Transect Survey (GOALS) to address the data needs for density analysis. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 for full discussion on the

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		exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. See 40 C.F.R. § 1502.22(a). Here, the Navy failed to obtain data that is essential to its analysis. The Navy itself admits that it has no density estimates for endangered blue whales, North Pacific right whales, and sei whales. In addition, there are simply no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in the GOA . Despite the lack of survey/density data, the Navy simply estimates that only 1 blue whale, 1 North Pacific right whale and 4 sei whales may be harmed by its use of sonar because of the "rareness" of those whales. NEPA requires more. It requires these surveys to be completed and included in the impacts analysis.	survey. CEQ regulation at 40 CFR §1502.24 requires the Navy to ensure the "professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements" and to "identify any methodologies used and make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement." Navy has met this requirement. The EIS represents the best available science and most applicable science on species and distribution. The Navy has taken a hard look through its analysis and has considered competing and contradictory scientific research. Under 40 CFR §1502.22, NEPA allows for recognizing incomplete and unavailable information. Information on species density found in Tables 3.8-1 and 3.8-2 of the EIS was compiled from NMFS Stock Assessments as well as the 2009 GOALs survey and two other vessel surveys in the GOA. Therefore, density data has been generated based on available data in coordination with technical staff from NMFS. Regarding density estimates, please see response to Maria Nasif – 2.
Maria Nasif - 8		In addition, the Navy's acoustics impact analysis ignores scientific studies contrary to its interests and uses methodologies not supported by the scientific community. Thus, the thresholds it sets for permanent injury, temporary injury (hearing loss) and behavioral change (which we would argue are too high and thus completely underestimate the actual number of wildlife that will be impacted) are invalid as a matter of science. For instance, in setting its thresholds at 195 dB for harassment and temporary injury and 215 dB for permanent injury and death, the Navy ignores a 2004 study by Nowachek et al which found that right whales respond to mid-frequency sound below 140 dB (the sound caused them to stop eating and ascend rapidly to just below the surface, making them extremely vulnerable to ship strikes).	The study referenced (by Nowacek et al. 2004) on right whales in the Atlantic exposed those whales to an sound designed to be an "alert stimuli" and was nothing like Navy sonar or any other Navy sound source. The "alert stimuli" signal was an 18 min exposure consisting of three 2-minute signals played sequentially three times over. The three signals had a 60 percent duty cycle and consisted of: (1) alternating 1-sec pure tones at 500 Hz and 850 Hz; (2) a 2-sec logarithmic down-sweep from 4,500 Hz to 500 Hz; and (3) a pair of low (1,500 Hz)-high (2,000 Hz) sine wave tones amplitude modulated at 120 Hz and each 1-sec long. The purposes of the alert signal were (a) to provoke an action from the whales via the auditory system with disharmonic signals that cover the whales estimated hearing range; (b) to maximize the signal to noise ratio (obtain the largest difference between background noise) and c) to provide localization cues for the whale. Five out of six whales reacted to the signal designed to elicit such behavior.
Maria Nasif - 9		9) The Navy's cumulative impacts analysis is inadequate. Chapter 4 of the DEIS simply lists projects that could have potential cumulative impacts on the Northwest Range without actually analyzing what those impacts will be.	The cumulative impacts analysis addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. Table 4-1 succinctly depicts the categories of past, present,

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			and reasonably foreseeable future actions that affect cetacean and fish populations. Identifying such activities and in fact comparing them for relative impacts is an appropriate approach to cumulative impacts analysis, which is what was done in Chapter 4. The EIS/OEIS does more than simply compare activities; it analyzes in detail the effects of Navy actions on specific resources and places those in the context of other sources of impacts. With regard to marine mammals and fish, the cumulative impacts analysis accurately concludes that Navy activities, while they may affect species, will not present significant impacts, or population level impacts to any species.
Maria Nasif - 10		10) The Navy's alternative analysis is also inadequate. The Navy only presents three options - maintain the status quo, add more training, or add even more training. It does not consider - or blithely dismisses - any other alternatives, some employed by the Navy itself in other training exercises and ranges.	The no-action alternative can be thought of in terms of continuing with the present course of action until that action is changed. (46 Fed Reg 18026, at 18027). Alternatives 1 and 2 discuss the increase from these levels. This is the approach properly taken in developing alternatives for this DEIS. (See #3 of CEQ's Forty Most Asked Questions). The Navy has discussed all alternatives that were considered but eliminated in Section 2.3.2 and the consideration of the no-action alternative, alternative 1, and alternative 2 within Chapters 3 and 4 ensures the Navy's compliance under NEPA.
Maria Nasif - 11		11) Finally - and most critically - the Navy does not set forth adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual monitors. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." (For instance, studies show that visual monitoring only spots about 5% of marine mammals. Statistically, a 5% "success" rate clearly does not cut it.) The Navy's refusal to employ better mitigation measures is astounding, because it has used more protective measures during previous training. As NRDC discovered during previous litigation against the Navy (and as our recent settlement agreement has allowed us to make public), the Navy has adopted, during previous exercises, some of the same mitigation measures we have repeatedly beseeched it to employ and which it now claims it cannot employ. These measures include siting exercises beyond the continental shelf and Gulf Stream, relocating exercises out of important habitat and to avoid certain species, and using a technique	Chapter 5 presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events at sea in the TMAA. As detailed in that section, the mitigation measures involve much more than a sonar "safety zone", make use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. The mitigation measures presented were developed in coordination with NMFS biologists and scientists to determine which mitigation measures would be both effective and still allow the Navy to meet its operational needs for realistic training. Please note that the comment referencing studies indicating "a 5% success rate" was with regard to survey protocols, were not done using Naval personnel or vessels (which have a higher height of eye for observation), and did not take into account the circumstances present during a training event such as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space. The Navy does not expect 100%

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		called "simulated geography" to avoid canyons and near-shore areas on at least three of its major ranges. It also restricted sonar use at night when marine mammals are harder to detect, as well as minimized the use of sonar from multiple sources at the same time. Although in Chapter 5 of the DEIS the Navy goes to some pain to describe "alternative mitigation measures considered but eliminated" - primarily for "training effectiveness" reasons - its previous adoption of the exact same measures belies its argument. The Navy's claim that it cannot implement more protective mitigation measures is therefore completely disingenuous. NO! TO NAVY TRAINING ACTIVITIES IN THE GOA!	of the animals present in the vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness, however, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. Section 5.2.1.6 from pages 5-28 through 5-41 provides detailed explanations for why some previously used or suggested measures have been eliminated from further consideration. In the first training events authorized under the Marine Mammal Protection Act, some measures were attempted in previous training events at other locations in the past (since 2006) but were subsequently shown to be clearly ineffective or having resulted in an impact to training realism. The suite of mitigation measures proposed by Navy, developed in coordination with NMFS, and presented in Chapter 5 provides the best balance between the need to be precautionary in the protection of marine mammals and the needs to realistically train at sea.
Marcelo Nasif - 1		Military readiness is vital to our national security, but it need not come at the expense of degraded water quality, fisheries and marine mammal populations. The Navy estimates that its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 425,000 marine mammal "takes" (behavioral impacts, harassment, injury, death) every year - that's over 2.125 million takes during the course of the Marine Mammal Protection Act permit it must seek from NOAA.	Please see response to Maria Nasif - 2.
Marcelo Nasif - 2		In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the GOA.	Please see response to Maria Nasif - 2.

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Marcelo Nasif - 3		Nearly all of the mitigation measures that the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far-reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast-moving vessels.	Please see response to Maria Nasif - 3.
Marcelo Nasif - 4		The Navy has not proposed to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife.	Please see response to Maria Nasif - 4.
Marcelo Nasif - 5		For example, no protection areas are proposed for harbor porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the TMAA; for endangered humpback whales and blue whales, which gather to feed in the TMAA; for the critically endangered North Pacific right whale, who's critical habitat is directly adjacent to the TMAA; or for any other species or habitat.	Please see response to Maria Nasif - 5.
Marcelo Nasif - 6		The Navy does not properly analyze environmental impacts. For instance, it completely disregards the serious impacts its sonar training will have on the critically endangered North Pacific right whales, whose critical habitat is only 12 nautical miles from the training area or the endangered gray whales, which migrate through the training area.	Please see response to Maria Nasif - 6.
Marcelo Nasif - 7		Furthermore, it fails to discuss and analyze the cumulative effects its activities may have in conjunction with other projects and activities in the area.	Please see response to Maria Nasif – 9.
Marcelo Nasif - 8		The Navy underestimates the number of marine mammals (and fish) that will be harassed, injured and killed because it simply does not have the density estimates needed in order to accurately make this determination. The National Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. See 40 C.F.R. § 1502.22(a).	Please see response to Maria Nasif - 7.
Marcelo Nasif - 9		The Navy's acoustics impact analysis ignores scientific studies contrary to its interests and uses methodologies not supported by the scientific community. Thus, the thresholds it sets for permanent injury, temporary injury (hearing loss)	Please see response to Maria Nasif - 8.

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		and behavioral change (which we would argue are too high and thus completely underestimate the actual number of wildlife that will be impacted) are invalid as a matter of science.	
Marcelo Nasif - 10		The Navy's alternative analysis is inadequate. The Navy only presents three options - maintain the status quo, add more training, or add even more training. It does not consider - or blithely dismisses - any other alternatives, some employed by the Navy itself in other training exercises and ranges.	Please see response to Maria Nasif - 10.
Marcelo Nasif - 11		Most critically, the Navy does not set forth adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual monitors. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." (For instance, studies show that visual monitoring only spots about 5% of marine mammals. Statistically, a 5% "success" rate clearly does not cut it.) The Navy's refusal to employ better mitigation measures is astounding, because it has used more protective measures during previous training.	Please see response to Maria Nasif - 11.
Elizabeth Neumann		I have been an Alaskan resident since 1988. My income has been dependant on the waters of Alaska for many years, in many different aspects.:Commercial Fishing as well as Tourism being the main ones. The proposal for the Gulf of Alaska {TMMA) in which the Navy plans to train is very risky and threatens the lives of the marine mammals in the area.. The amount of spent waste and hazardous materials projected to be released into the waters is too high. The 425, 000 marine mammal takes each year is outrageous and the small safety zone around the sonar ship is inadequate. I do not support this proposal and hope to see that is does not come into fruition. Thank you for your time Elizabeth Neumann	As presented in Section 3.12, with regard to the continuation of Navy training as has been occurring for over 10 years or the proposed addition of increased training activities - neither should impact commercial fishing or tourism (also see Chapter 4 regarding cumulative impacts). Please see Section 3.8 with regard to the estimated impacts on marine mammals noting the number of exposures cited for Alternative 2 does not take into consideration a likely reduction in those numbers as a result of implementing Navy's standard mitigation measures. In addition, the Navy feels the estimated “takes” are overestimates for numerous reasons, including: 1) Where a range of density estimates existed, or where densities were seasonal, the modeling considered only the greatest density. This assumption leads to more animals within a sonar’s range, and therefore more takes, 2) The modeling estimates do not consider the positive impacts of the Navy’s mitigation measures. In reality, many of the estimated takes (primarily TTS) would be eliminated due to power down procedures in place as a marine mammal approaches a sonar source, and 3) All surface ship sonars are modeled as the more powerful SQS-53C, when in reality, 60% of all surface ship sonar hours

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			proposed are significantly less powerful (225 dB compared to 235 dB of the SQS-53C). Regarding spent waste and hazardous materials, please see response to Alaska Glacial Mud Co. - 1.
Cherie Northon, Ph.D.		Right whales and sonar disruption!!! What are you thinking? No one is arguing that National Defense is important, but it should not be at the expense of this valuable resource. Surely we can figure out another way, place, and time to deal with this. I support the "no action" option. Cherie Northon, Ph.D.	The Navy fully analyzed potential impacts to marine life, including the North Pacific right whale. As presented in Section 3.8 and shown on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA. Most of the activities proposed will take place far from this corner of the TMAA since the boundaries defined by that corner would otherwise constrain training realism, especially in terms of ASW training. Additionally, the Navy has conducted mid-frequency and high-frequency active sonar activities for decades with no indications of injuries to resident beaked whales at training ranges in Hawaii and Southern California or to right whales on the East Coast. There are no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Please note that the decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
John O'Brien Jr.		National security is # 1 in my book. Sonar testing is necessary in order to maintain a top of the line naval defense. The gulf of Alaska is a perfect place to test any and all Sonar equipment. Full speed ahead!	This comment is duly noted.
Jeanne Parker		I am strongly opposed to any increase in sonar, radar sinking of ships or munitions, or any other changes to what the navy is already doing in this sensitive and productive area of the Gulf of Alaska. I support the "no action" alternative, which will allow the navy to continue training as they have previously in this area, but does not increase toxic dumping or entails the use of sonar, which has been documented to be harmful to marine mammals and fish.	This comment is duly noted. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process. Please note that the Navy does not conduct toxic dumping and that the Navy has conducted active sonar activities for decades in oceans all around the world with no documented proof of injuries to marine mammals. Given the natural variation of marine mammal locations over time within the GOA TMAA, operational variability of Navy active sonar operations, and the fact that there is little documented scientific information demonstrating broad-scale impacts that

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			are either injurious or of significant biological impact to marine mammals, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Jeremiah Parsons		I believe the naval training exercises proposed would damage the ecology of the Gulf of Alaska. I do not believe that the mitigation proposed is adequate to protect this vital resource.	The Navy's protective measures are effective at mitigating, not eliminating, risk to the ecosystem and ecology of the GOA. Based on the analysis included in this EIS/OEIS, including the Navy's interests in environmental stewardship, the Navy feels its established protective measures are adequate. These measures have been developed in conjunction with NMFS.
Nancy Pease - 1		Regarding: Gulf of Alaska Navy Training EIS/OEIS The Preferred Alternative poses unacceptable risks of irreversible or long-term damage to the natural environment, and particularly to marine mammals and the fisheries in the Gulf of Alaska. The projected 2.125 "takes" of marine mammals over the span of the permit is a horrific toll toll, especially considering that there are 7 endangered marine mammals in the Gulf waters.	The EIS/OEIS used the most current, relevant scientific information, in coordination with the National Marine Fisheries Service, to develop the analysis on sonar training and potential impacts to marine mammals. Regarding "takes" please see response to Judith Brakel – 1.
Nancy Pease - 2		It is a dereliction of due process that the Navy doesn't even have the density data on marine mammals to know if this projected take is accurate.	Section 3.8.2 in the EIS/OEIS discusses the density estimates: In April 2009, the Navy funded and NMFS conducted the Gulf of Alaska Line-Transect Survey (GOALS) to address the data needs for density analysis. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 and Appendix E – Marine Mammal Density and Depth Distribution, for full discussion on the survey and the marine mammal densities.
Nancy Pease - 3		The proposed 1000 yard/200 yard safety zones are a travesty, since the federal courts have already found that these distances are "woefully inadequate".	Chapter 5 presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events at sea in the TMAA. As detailed in that section, the mitigation measures involve much more than a sonar "safety zone", make use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. The mitigation measures presented were developed in coordination with NMFS biologists and scientists to determine which mitigation measures would be both effective and still allow the Navy to meet its operational needs for realistic training. Please note that the Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history

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			of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate.
Nancy Pease - 4		The proposed visual look-outs for marine mammals is also woefully inadequate, given that only 5 percent of marine mammals are typically spotted.	Please note that the text referencing studies indicating "a 5% success rate" was with regard to survey protocols, were not done using Naval personnel or vessels (which have a higher height of eye for observation), and did not take into account the circumstances present during a training event, such as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space. The Navy does not expect 100% of the animals present in the vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness. However, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports “Marine Mammal Monitoring for the U.S. Navy’s Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)” available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. As part of the Integrated Comprehensive Monitoring Program, research to measure the ability of Navy observers to detect marine mammals is also underway.
Nancy Pease - 5		The trashing of the waters with 352,000 pounds of debris annually is totally unacceptable. As a family that commercially fishes these waters, we object to the fouling of the food chain and the dangers of objects and substances left in the water column or on the sea floor. Civilian vessels follow strict regulations about debris, and mostly pack it back to shore. The Navy also needs to haul its trash ashore especially any hazardous or chemical debris. Even if chemicals are dispersed, the suspicion of tainted waters and	The Navy is not proposing to dump wastes in the Gulf of Alaska. Regarding you comment on debris, please see response to Alaska Glacial Mud Co. – 1. Additionally, please note that the analysis presented in the EIS/OEIS indicates that expended materials remaining in the TMAA would not affect the food chain and would not pose a reasonable risk to the public. Additionally, please note that the Navy is a seagoing force, and that two-thirds of the world's surface is covered by water, means that many of our environmental initiatives focus

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		tainted fish can be a blow to the fishing industry. Healthy oceans are critical to our state and world future.	on ocean stewardship and seek opportunities to control our "ecological footprint" in relation to marine life, coastal impacts, and water quality. We have installed technology aboard our ships to keep plastics out of the ocean and safely manage our biodegradable waste stream.
Nancy Pease - 6		The only of the alternatives that balances environmental protection and military training is the No Action alternative. Let the Navy continue existing training, but do not allow sonic impacts or the waste dumping in the Gulf of Alaska.	Please see response to Ellen Americus – 1. Sonic impacts have been discussed in Section 3.4 (Acoustics) and as they relate to marine mammals in Section 3.8. The Navy is not proposing to dump wastes in the Gulf of Alaska and dumping is not practiced by Navy ships.
David Peterson	Dorobo Safaris	I am distressed to learn about the Sonic boom and military exercises planned by the Navy in the Gulf of Alaska. Having visited Ak for the first time in 08, I was impressed with the rich diversity and abundance of marine life and the relatively intact nature of the ecosystems. It is simply unacceptable in this day and age with natural and particularly marine systems under so much pressure for the Navy to be contemplating such exercises.	Sonic boom testing is not part of the proposed action for this EIS/OEIS. However, throughout the course of the exercise, individual planes may attain supersonic speeds within the TMAA. This would create a sonic boom. The effects of which have been analyzed in Section 3.4 (Acoustics) and as they relate to marine mammals in Section 3.8. Please refer to Chapter 1 for the purpose and need of the Proposed Action.
Donna Pierce		I am very concerned about the potential, even likely harm to marine mammals from the proposed sonar training. I do not question the need for training, but I urge the Navy to find a site and a time that avoids critical habitat. Thank you.	The Navy shares your concern for marine life. As such, it Navy conducted a thorough analysis of sonar effects in the EIS/OEIS, using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. The results indicate that no significant harm would come to any marine mammal population. With regard to protecting marine mammal habitat, the Navy altered the boundary of the TMAA to avoid the Critical Habitat boundary established for the Stellar sea lions and the TMAA is many miles from the protective areas established for right whale, sea otter, and beluga whale; there is no designated marine mammal habitat in the TMAA by design.
Pioneer Alaskan Fisheries Inc. - 1		The Gulf of Alaska is our fishing grounds. The coastal currents flow through the gulf and into Cook Inlet and down through Kodiak and out the chain. We saw very vividly how these currents flow during the Exxon Valdez Oil Spill.	This comment is duly noted.
Pioneer Alaskan Fisheries Inc.- 2		Multiple species of migratory birds and in particular twelve species of declining and endangered Waterfowl, Tribe Mergini, winter in the Gulf of Alaska. King Eider, Common Eider, the endangered Stellers Eider, the endangered Spectacled Eider, Surf Scoter, White-winged Scoter, Black Scoter, Long-Tailed duck, Harlequin, Barrows Goldeneye,	Section 3.9 of the EIS/OEIS provides a thorough analysis of potential impacts to seabirds, including those mentioned in your comment. This analysis concluded that the Navy's proposed summer time activities would have no significant impacts to birds. The USFWS has concurred with the Navy's determination of "may affect, not likely to adversely affect"

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		Common goldeneye, Bufflehead These birds are in endangered or declining status and cannot withstand another cumulative effect weakening their numbers further from war games, disturbance, spilled toxins, noise, explosives etc.	short-tailed Albatross, the only threatened and endangered seabird potentially present within the TMAA. Please see Appendix C, Regulatory Consultations.
Pioneer Alaskan Fisheries Inc. - 3		Please do not perform your games in areas of pristine water quality. These areas need to remain clean, undisturbed quiet and in their natural state. We need to have some places on earth that are sacred. The Gulf of Alaska is one of these places. With Kind Regards Nancy Hillstrand Pioneer Alaskan Fisheries	Please see response to Judith Brakel – 6.
Elaine Polinsky		My opinion is that the lives of these mammals need to be cherished and protected ... please do so ... Scientists estimate that only 300 to 400 of these whales remain .... listed as endangered in 1973 ... the population of right whales has made little progress toward recovery. In 2004, the National Marine Fisheries Service wrote that the "loss of even a single individual right whale may contribute to the extinction of the species." http://www.nmfs.noaa.gov/pr/pdfs/statusreviews/rightwhale2006.pdf north pacific right whale population has been "depleted by commercial whaling..... In the last several decades there have been markedly fewer sightings .... right whale sightings in the eastern and central North Pacific have been so rare that single sightings ... resulted in scientific publications .. paucity of sightings of right whales in the eastern North Pacific is apparent despite high levels of survey effort in the region, notably from Japanese sighting surveys ... Recent summer sightings of right whales in the eastern Bering Sea .. represent the first reliable observations of associated groups in the eastern North Pacific since the 1960s."	The Navy fully analyzed potential impacts to marine life, including the North Pacific right whale. As presented in Section 3.8 and show on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA. Most of the activities proposed will take place far from this corner of the TMAA since the boundaries defined by that corner would otherwise constrain training realism, especially in terms of ASW training. Additionally, the Navy has conducted mid-frequency and high-frequency active sonar activities for decades with no indications of injuries to resident beaked whales at training ranges in Hawaii and Southern California or to right whales on the East Coast. There are no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Dean Rand - 1		January 12, 2010 Comment: I am a 32 year veteran Captain of the commercial fishing, scientific research, and tourism industries here in the North Pacific Gulf of Alaska. I oppose the Navy's plan to conduct training exercises in the Gulf of Alaska. I firmly believe that the Navy's plan would further damage the area's already damaged habitat and its wildlife populations. This area's habitat and wildlife populations have historically been subjected to stresses from many sources most of which have been and continue	The Navy has been conducting much of the proposed training in the Gulf of Alaska for over 10 years. Effects of past, present and planned Navy activities have been discussed in Chapter 4; Cumulative Impacts and constitute a very small portion of the overall commercial and recreational activities that take place in those waters.

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		to be various forms of modern commercial use and development. Most of these activities are commercial enterprises such as but not limited to: Industrial whaling, which removed upwards of a half million great whales between 1949 and the mid 1970's. It's well documented that most species of great whales have not recovered from this.	
Dean Rand - 2		It's also been well documented over the years that military sonar are extremely harmful to whales' physiology.	Please note that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The Navy's analysis indicates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Additionally, please see response to Ellen Americus – 3.
Dean Rand - 3		It's also a well documented fact that underwater explosions will produce immense shock waves killing or injuring fish, mammals, and seabirds.	As described in Section 3.6, the use of explosive devices may result in injury or mortality to individual fish but would not result in impacts to fish populations. It is less likely that marine mammals and birds as a result of implemented mitigation measures as detailed in Section 5.2.1.2.
Dean Rand - 4		The 1971 underground explosive testing at Amchitka Island, although detonated a full mile under land, still produced enough shock wave in the surrounding waters to kill virtually every fish, marine mammal and sea bird within three miles of the Island's shore. This is all well documented in Govt. research papers.	No such similar activities are proposed in this document and the size of the devices that are proposed for use are too small to result in a shock wave that would result in mortalities at that great a distance.
Dean Rand - 5		The Navy's plan to have a watch persons stationed on the decks of their ships so that they can look for and warn the ship away from any mammals is ... well ... besides being grossly flawed, is just about the dumbest thing I've heard in a long time. Like ... some watch person can see as far as the sonar or underwater explosions will reach is ridiculous! I do mammal and sea bird surveys for the Govt. and we can't effectively see our target animals with the best binoculars in conditions where there are waves of any more than six inches of height. Marine mammals and sea birds live either under dark water or very close to the surface. This is not Sea World! When the wind is blowing over 10 knots, it's near to impossible to spot the whales as they surface and blow unless they surface directly in front of one's eye's and at a close enough range (within a hundred meters). The wind immediately knocks the tell-tale blow mist away and	As detailed in Chapter 5 of the EIS/OEIS, the mitigation measures involve much more than visual observers on ships, make use of those in aircraft, in addition to use of all available sensors such as passive acoustic hydrophones. The mitigation measures presented in the EIS were developed in coordination with the National Marine Fisheries Service (NMFS) biologists and scientists to determine which mitigation measures would be both effective and still allow for Navy to meet operational needs for realistic training. Please note that Naval vessels have a higher height of eye than most vessels (putting them above much of the mist and spray) as well as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space. The Navy does not expect 100% of the animals present in the

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		the waves camouflage the whales' body making observations extremely difficult if not impossible. Most wild animals do not want to be discovered. That is how they try to survive in the Wild. They will not let the Navy or anyone else find them if they can help it.	vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness, however, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. As part of the Integrated Comprehensive Monitoring Program, research to measure the ability of Navy observers to detect marine mammals is also underway.
Dean Rand - 6		Again, this is not Sea World. Industrial fishing, before the advent of conservation based on science and not on politics, over harvested most of the region's commercially valuable fishes and shell fish such as salmon, herring, halibut, black cod, crab, and shrimp. All of these species live In or are dependent on the habitat within which the Navy proposes to conduct its training.	Please see Chapter 3 of the EIS/OEIS for the description and analysis and potential effects. Specifically, those effects to the economy are found in Section 3.12; to marine life in Sections 3.5 through 3.9. Because the Navy has no exclusive “right of way” when conducting training activities on the ocean, Navy ships and aircraft intentionally seek areas clear of all other vessel traffic, thereby reducing the likelihood of negatively affecting fishing and tourism industries. In addition, impacts to habitat and fish have been thoroughly assessed utilizing the best available science and data, and while localized impacts may occur, given the temporal and spatial nature of the activities, the impacts would not result in a population-level or a significant impact to habitat and/or fish resources/fisheries.
Dean Rand - 7		Many of these species populations have not recovered from their historic over harvest. To further stress these stocks with this proposed Naval training exercise and its associated shock waves, and toxins from spent explosives would be irresponsible.	Table 4-1 succinctly depicts the categories of past, present, and reasonably foreseeable future actions that affect cetacean and fish populations. The EIS/OEIS analyzes in detail the effects of Navy actions on specific resources of Fish (see Sections 3.6.2) and places those in the context of other sources of impacts. Section 4.2.6 (Fish) discusses the cumulative effects of Navy activities and commercial fishing in the GOA. Section 4.2.8 (Marine Mammals) addresses the threats to marine mammals in past decades, the most damaging being; direct catch, bycatch, and pollution (Figure 4-1). Regarding toxins and spent explosives, only a small portion of the expended training materials, by weight, would be explosives, and all but trace quantities of explosives byproducts would be consumed during their use (detonation); high-order detonations are approximately 99.997% efficient in

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			converting explosives to non-hazardous inorganic compounds (see Page 3.2-2 of the EIS/OEIS). These trace quantities of byproducts would be quickly dispersed. Byproducts of live ordnance are addressed in Section 3.2 of the EIS/OEIS. The majority of expended materials used in the Proposed Action are heavy objects that will sink to the bottom of the water column. In items that fail to detonate (duds), the explosives and propellants usually are contained within a metal casing. Encrustation and burial in the substrate prevent leaching from expended materials. Any leaching that occurs will be diluted by ocean currents in this very large and dynamic open ocean environment. Thus, high concentrations of TNT or other explosives in marine waters surrounding expended training items are not expected.
Dean Rand - 9		Oil & gas development, which began over 50 years ago in the Gulf of AK and Cook Inlet, continues to pollute the waters of this region thus hampering the recovery of the region's habitat, wildlife and fish stocks. Alaska's largest urban population center (the Anchorage bowl With some 300,000 residents) dumps virtually all of its waste water, untreated, into Cook Inlet which in turn runs Into the same area planned for this Naval exercise in the Gulf of Alaska.	Effects of past, present and planned Navy activities have been discussed in Chapter 4; Cumulative Impacts. For the purposes of determining cumulative effects in this chapter, the Navy reviewed environmental documentation regarding known current and past Federal and non-Federal actions associated with the resources analyzed in Chapter 3. Additionally, projects in the planning phase were considered, including reasonably foreseeable (rather than speculative) actions that have the potential to interact with the proposed Navy action.
Dean Rand - 10		Indeed, just recently the Federal Govt has listed Cook Inlet's Beluga Whale population as threatened, due to its rapid demise, more than likely from habitat degradation. To implement this planned Naval training exercise with its associated environmental harms, in the area immediately adjacent to the beluga critical habitat would be grossly negligent.	As per Chapters 1 and 2 of the FEIS/OEIS, the TMAA is located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore; far from the Cook Inlet and will have no impact on the Cook Inlet beluga whale.
Dean Rand - 11		In 1989 the oil tanker Exxon Valdez spilled 11.8 million gallons of toxic crude oil into the same region as the Navy plans this exercise. Much of the habitat and many wildlife species studied have not recovered from this one event. For the US military to add more harm to this area's habitat, and it's wildlife in light of all the man made damage that's already been done, would also be grossly negligent. Thank you for the opportunity to comment on this proposed activity. Captain Dean Rand	The near edge of the TMAA is beyond 50 nautical miles from the edge of Prince William Sound. There are no activities proposed for that area or that will impact wildlife or habitat in that area. Thank you for taking part in providing public input to this process.
Bruce Rein	GCI	Just read through the posted EIS documents and they again	This comment is duly noted.

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		fail to note that several vital telecommunication cables are located in the area. In light of recent federal US vessel operational incidents causing damage to submarine cables it is very important that the location and protection of these very important communication links for the State of Alaska as well as DOD communications is addressed. There is discussion of Submarine activities and the deployment of PUTR's on the seafloor - these activities have the potential to damage submarine cables in the area. The location of these cable are clearly plotted on NOAA charts or I can provide you data on the cable locations. Bottom operations must be avoided in this area. I will be traveling during the comment sessions in January and will not be able to attend.	
C.A. Ryan - 1		Military readiness is vital to our national security, but it need not come at the expense of degraded water quality, fisheries and marine mammal populations. The Navy estimates that its sonar training exercises in the GOA from its Preferred Alternative (Alternative 2) will result in more than 425,000 marine mammal "takes" (behavioral impacts, harassment, injury, death) every year - that's over 2.125 million takes during the course of the Marine Mammal Protection Act permit it must seek from NOAA. In all, the Navy expects to "take" more than 20 different species of marine mammals, including 7 endangered species, in the GOA.	Please see response to Maria Nasif - 2.
C.A. Ryan - 2		Nearly all of the mitigation measures that the Navy has proposed for the GOA concern the operation of a small "safety zone" around the sonar ship. Yet it is widely agreed in the scientific community that this measure is inadequate given the far-reaching effects of Navy sonar and the difficulty of spotting marine mammals from fast-moving vessels.	Please see response to Maria Nasif - 3.
C.A. Ryan - 3		The Navy has not proposed to establish any protection areas in the GOA, despite the broad recognition that geographic protection zones are the most effective available means to mitigate sonar's impacts on marine wildlife.	Please see response to Maria Nasif - 4.
C.A. Ryan - 4		For example, no protection areas are proposed for harbor porpoises, which are acutely sensitive to sound; for endangered gray whales, which migrate directly through the TMAA; for endangered humpback whales and blue whales, which gather to feed in the TMAA; for the critically endangered North Pacific right whale, who's critical habitat	Please see response to Maria Nasif - 5.

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		is directly adjacent to the TMAA; or for any other species or habitat.	
C.A. Ryan - 5		The Navy does not properly analyze environmental impacts. For instance, it completely disregards the serious impacts its sonar training will have on the critically endangered North Pacific right whales, whose critical habitat is only 12 nautical miles from the training area or the endangered gray whales, which migrate through the training area.	Please see response to Maria Nasif - 6.
C.A. Ryan - 6		Furthermore, it fails to discuss and analyze the cumulative effects its activities may have in conjunction with other projects and activities in the area.	Please see response to Maria Nasif - 9.
C.A. Ryan - 7		The Navy underestimates the number of marine mammals (and fish) that will be harassed, injured and killed because it simply does not have the density estimates needed in order to accurately make this determination. The National Environmental Policy Act (NEPA) specifically requires federal agencies to obtain the data necessary to their analysis. The simple assertion that "no information exists" will not suffice; unless the costs of obtaining the information are exorbitant, NEPA requires that it be obtained. See 40 C.F.R. § 1502.22(a).	Please see response to Maria Nasif - 7.
C.A. Ryan - 8		The Navy's acoustics impact analysis ignores scientific studies contrary to its interests and uses methodologies not supported by the scientific community. Thus, the thresholds it sets for permanent injury, temporary injury (hearing loss) and behavioral change (which we would argue are too high and thus completely underestimate the actual number of wildlife that will be impacted) are invalid as a matter of science.	Please see response to Maria Nasif - 8.
C.A. Ryan - 9		The Navy's alternative analysis is inadequate. The Navy only presents three options - maintain the status quo, add more training, or add even more training. It does not consider - or blithely dismisses - any other alternatives, some employed by the Navy itself in other training exercises and ranges.	Please see response to Maria Nasif - 10.
C.A. Ryan - 10		Most critically, the Navy does not set forth adequate measures to mitigate the harmful effects of sonar. Its proposed mitigation measures basically boil down to "safety zones" (1,000 yard power-down and 200 yard shut down) around the sonar maintained primarily by on-board visual monitors. These are the same measures that federal courts have found to be "woefully inadequate and ineffectual." (For	Please see response to Maria Nasif - 11.

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		instance, studies show that visual monitoring only spots about 5% of marine mammals. Statistically, a 5% "success" rate clearly does not cut it.) The Navy's refusal to employ better mitigation measures is astounding, because it has used more protective measures during previous training.	
Frani Scheffel	DESIGNS for LIFE	Please consider the past results of such trainings on marine life and stop this plan...when are you going to learn...the beluga is all but extinct in Cook Inlet...other endangered whales are at risk and the salmon runs are suffering...you want to add to these problems by continuing with your war games...spend the monies nation building instead of testing your already over done arsenals of waste and destruction...you have done enough degradation to our oceans and marine life...STOP THIS PLAN...thank you... F.Scheffel Homer AK	Please note that there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment. Additionally, the cumulative impacts analysis section addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. Table 4-1 succinctly discusses all development, including oil and gas development, of past, present, and reasonably foreseeable future actions that affect marine populations.
Marianne & William Schlegelmilch		We proudly support our military services and understand the need to conduct live exercises. In this instance, however, we disagree with the proposal to conduct live exercises with ammunition and sonar in the Gulf of Alaska, one of the few remaining pristine oceans on the earth. We believe that the impact on our fisheries and on the ecosystem in general would disrupt the balance of nature and fear lasting ramifications to the Gulf and the ecosystem there. We urge the US Navy to re-think this plan and conduct the exercises in another location that will not impact our food supply, and one of the last pristine areas on earth. Although we support the Navy and thank them for protecting us, we are opposed to this operation for the reasons described above--especially if another area can be found for the exercises that will feel less impact than ours would.	As presented in Chapter 4, the cumulative effects of Navy training activities have been considered in addition to the numerous other activities taking place in the Gulf of Alaska including, commercial fishing. Based on having conducted most of the proposed training activities over the last 10 years in Gulf of Alaska with no indications of there having been consequences on marine resources there it, is unlikely that the proposed activities would have wide ranging impacts. As detailed in Sections 3.6 and 3.12, there should be no significant impacts to fisheries or the food supply (as represented by the fisheries) as a result of the proposed actions. As explained in Section 2.3.2.1 of the EIS/OEIS, relocating training activities to another location would not support the Navy's Purpose and Need and was therefore eliminated from further consideration.
Evelyn Seguela		Please do not do sonar stuff in Cook Inlet! Far too damaging to the animals living in cook inlet waters!! No Need to do this, really...come on! Bad Bad No No	Please note that no Navy training activities are proposed to take place in Cook Inlet. As per Chapters 1 and 2 of the EIS/OEIS, with the exception of Cape Cleare on Montague Island, the TMAA is located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore, far from the Cook Inlet.
Erin Shew - 1		Dear Mrs. Amy Burt: I am writing to express my concern over the proposed	As presented in Chapter 4, the cumulative effects of Navy training activities added to the numerous other activities taking

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		training exercises that the Navy has outlined in its Gulf of Alaska EIS analysis. I understand the need for readiness for our troops and appreciate all that is already done by the Navy to protect our people and lands. However, I worry about the economic and ecological damages that could occur in one of the United States' most important fisheries if the proposed training proceeds without a better understanding of the baseline conditions in the Gulf of Alaska, in addition to the individual and cumulative long-term effects of materials used in the training on marine ecosystems. I urge the US Navy to adopt the "No Action" alternative at this point in time until further baseline studies of marine ecosystems and the trainings' impact on fisheries in the Gulf of Alaska can be conducted.	place in the Gulf of Alaska including commercial fishing. As detailed in Sections 3.6 and 3.12, there should be no impacts to fisheries or the food supply (as represented by the fisheries) as a result of the proposed actions. The Navy considered the best available science in preparation of this EIS/OEIS and is in consultation with NMFS as the regulator and a cooperating agency with regard to the proposed action and any resultant mitigation measures as conditions of anticipated authorizations under the MMPA or reasonable and prudent measures resulting from issuance of a Biological Opinion under ESA.
Erin Shew - 2		After reviewing the EIS, my primary concerns regard the potential short and long-term impacts of introducing so many foreign, and in some cases hazardous, materials into our fisheries ecosystem without really understanding that ecosystem. The draft EIS does not give a breakdown of how much of each material is going to be introduced under each alternative. Nor does it contain information regarding the possibility of long-term effects on our fisheries resources from separate hazardous materials or the combinations of those hazardous materials.	Please see response to Bryson – 4.
Erin Shew - 3		Bioaccumulation of hazardous materials could potentially raise the level of contamination above what is considered a safe level over numerous years of training exercises.	With regard to bioaccumulation, please see response to Kate Alexander - 3.
Erin Shew - 4		In addition, ocean currents could potentially "trap" certain materials in specific areas, leading to high concentrations of those materials in one place. More information about what materials will be released and further study as to how those materials will affect the marine ecosystem should be a part of the final EIS.	As discussed in Shew-2, constituents of expended materials are not be expected to be present at harmful concentrations in water or sediments due to the size of the TMAA, the widely dispersed training throughout the area, and the strong ocean currents of the GOA. There are no known gyres or other large-scale natural mechanisms that would tend to concentrate floatable or suspended residues from expended materials. The known GOA bathymetry and ocean currents are described in Section 3.3.1.1. of the Final EIS/OEIS.
Erin Shew - 5		In addition to the unknowns surrounding the release of hazardous materials, there is a lot that yet needs to be understood regarding the physical and behavioral effects of using explosives in the region. For example, the draft EIS says that it has been proven that explosions can cause physiological damage to fish with swim bladders. How will	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the EIS/OEIS, analysis of impacts to fish, including those with swim bladders, are found in Section 3.6 of the EIS/OEIS. Currently, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of fish

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		these explosions affect our salmon and herring, in addition to other economically and culturally important fish?	populations. As such, the Navy believes, and the analysis indicates, that its training activities will not impact the fisheries off the Gulf of Alaska, although possible impacts to individual fish may occur.
Erin Shew - 6		The proposed method of "spotting" marine mammals before training exercises also creates uncertainties as to the actual number of marine mammals that will be unintentionally affected. The concussive effects of explosions can be felt beyond the distances where the Navy halts training due to the proximity of a marine mammal detected on sonar. Aerial spotting only provides a cursory understanding of the location of marine mammals, and seems an inadequate measure of how many are in an area. Again, further measures to protect marine mammals and further studies as to their at-sea behavior should be included in a final EIS.	The US Navy in conjunction with NMFS and USFWS is best suited to determine what mitigation it can effectively use during its training and testing activities to mitigate harm to marine mammals while still being able to meet its operational needs to train for real-world conditions it may face. The Navy's mitigation scheme is more than just visual monitoring. Aerial monitoring and sonar power-down protocols are used as well. Chapter 5 presents the US Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. Navy does not expect all animals present in the vicinity of training events will be detected, and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness. With that said, the Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate.
Erin Shew - 7		I believe that a question the public must ask in this matter is: why here? Why does the Navy need to conduct potentially harmful training drills in one of the richest and most intact marine ecosystems within the U.S.? And how can the U.S. government justify such potentially intrusive training without a better understanding of its effects on marine mammals and without an established baseline for this ecosystem? I am not opposed to training our troops to be better able to respond to domestic threats. However, I worry that we harm ourselves, and threaten our environmental, physical, and economic health, with these exercises in this specific location. There are many established training zones in less productive waters. The Navy should consider all these locations before deciding on the Gulf of Alaska for mid-range sonar and SINKEX training.	As explained in Section 2.3.2.1 of the EIS/OEIS, a relocation of activities outside of the GOA would not support the Navy's Purpose and Need and was therefore eliminated from further consideration. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Erin Shew - 8		The Navy should also work with various agencies such as NOAA to establish an understanding of the ecosystem and	As detailed in Section 3.8, this EIS/OEIS was developed in partnership with National Marine Fisheries Service (a part of

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		baseline conditions before deciding that Alternative 2 is the preferred alternative.	NOAA) as a cooperating agency. The ecosystem and baseline conditions are described in detail in the affected environment discussion of each of the resource areas of the EIS/OEIS.
Erin Shew - 9		Finally, if the training exercises do proceed, the Navy and partners should continue to conduct scientific investigations on the effects of the training on the ecosystem and be willing to consider alternatives if training exercises appear to have a negative impact. Thank you for considering my comments before the issuance of the final EIS. Sincerely, Erin Shew P.O. Box 1482 Cordova, AK 99574 erin_shew@hotmail.com mailing address after 09/01/2010: P.O. Box 1862 Kenai, AK 99611	As presented in Chapter 5, an Integrated Comprehensive Monitoring Plan and research specific for the TMAA are planned for implementation before, during and after Navy training activities as part of mitigation and monitoring of Navy training exercises. These two components were developed in cooperation with NMFS, who regulates ESA and MMPA compliance.
Martha Siebe		I am alarmed at the impact indicated by the Navy's training proposal. Marine mammals have been impacted repeatedly in areas where similar exercises have taken place. I understand that the Navy has even used more protective measures in other places than they are proposing here. The oceans are vast and seem limitless, but they are not. There are many changes impacting the life in our oceans which we do not fully understand. Visual monitoring of an area only tracks 5% of marine mammals. These animals are very sensitive to sonar assaults on their systems. The animals depend on these for survival. Please establish large safety zones and times. Please listen to independent scientists about what measures will lead to less impact on marine mammals and other life forms in the oceans. We are not the only species of value on this earth!	Chapter 5 presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events at sea in the TMAA. As detailed in that section, the mitigation measures involve much more than a sonar "safety zone", make use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. The mitigation measures presented were developed in coordination with NMFS biologists and scientists to determine which mitigation measures would be both effective and still allow the Navy to meet its operational needs for realistic training in the GOA. Please note that the comment referencing studies indicating "a 5% success rate" was with regard to survey protocols, were not done using Naval personnel or vessels (which have a higher height of eye for observation), and did not take into account the circumstances present during a training event such as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the waterspace. The Navy does not expect 100% of the animals present in the vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness, however, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please

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			see the recent results supporting this as presented in training ranges monitoring reports "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. As part of the Integrated Comprehensive Monitoring Program, research to measure the ability of Navy observers to detect marine mammals is also underway. Section 5.2.1.6 from pages 5-28 through 5-41 provides detailed explanations for why some previously used or suggested measures have been eliminated from further consideration. In the first training events authorized under the Marine Mammal Protection Act, some measures were attempted in previous training events at other locations in the past (since 2006) but were subsequently shown to be clearly ineffective or resulted in an impact to training realism. The suite of mitigation measures proposed by Navy, developed in coordination with NMFS, and presented in Chapter 5 provides the best balance between the need to be precautionary in the protection of marine mammals and the needs to realistically train at sea.
Sierra Club Alaska Chapter - 1		Dear Ms Burt: The Sierra Club Alaska Chapter (Alaska Chapter) appreciates and supports our armed services' commitment to protecting the nation and its citizens. Our members applaud the hard work of maintaining combat readiness and want to see training activities test troops, equipment, and systems under the most difficult environmental conditions likely to be encountered during actual military confrontations.	This comment is duly noted.
Sierra Club Alaska Chapter - 2		Unfortunately, after examining the document, we conclude that the alternatives offered in the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement (DEIS) cannot do so.	This comment is duly noted.
Sierra Club Alaska Chapter - 3		At the same time, we remind you that the nation's priceless natural resources and the public health are significant parts of what our great military is charged with defending. Under scenarios outlined in the DEIS, our navy would be given a mandate to significantly degrade Gulf of Alaska ecosystems and destroy an astonishing amount of fish and wildlife. Tons of expended munitions and other discarded, hazardous	The Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS. Specifically, the EIS/OEIS thoroughly analyzes the impacts of expended materials used during Navy training activities. Only a small portion of the expended training materials, by weight, would be explosives, and all but trace quantities of

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		materials would be left to pollute the waters with potential to cause ongoing harm to the biota and the health of people who consume seafood taken in this region.	explosives byproducts would be consumed during their use (detonation); high-order detonations are approximately 99.997% efficient in converting explosives to non-hazardous inorganic compounds (see Page 3.2-2 of the EIS/OEIS). These trace quantities of byproducts would be quickly dispersed. Byproducts of live ordnance are addressed in Section 3.2 of the EIS/OEIS. Furthermore, of the estimated 352,000 lb of material that would be expended, in less than 3 percent of it the material is considered hazardous. Section 3.2 of the EIS/OEIS describes the impacts of potentially hazardous materials such as explosives constituents. Section 3.3 describes the impacts of expended materials in terms of water and sediment quality. The analysis presented in the EIS/OEIS indicates that expended materials remaining in the TMAA would not affect the food chain and would not pose a reasonable risk to the public. Chapter 4 includes cumulative analysis of all past, present, and reasonably foreseen future projects by the Navy and non-Navy activities. Regarding bioaccumulation, please see response to Kate Alexander - 3.
Sierra Club Alaska Chapter - 4		The Alaska Chapter and our Juneau Group are signatories to the Natural Resources Defense Council (NRDC) comments submitted January 25, 2010 by Staff Attorney Taryn Kiekow. We concur with its assessment that the DEIS is deficient. Please refer to that document for detailed analysis and recommendations. We provide a brief supplement to that testimony below.	This comment is duly noted, and responses to those written comments can be found in the written comment response table under NRDC.
Sierra Club Alaska Chapter - 5		1) First to the matter of the failure of the DEIS to provide alternatives sufficient to assure realistic training opportunities. Appendix A of the NRDC testimony appropriately points out that: "The DEIS does not include any discussion of alternative sites, instead proposing a No Action alternative (maintaining the current level of activities), Alternative 1 (increasing training activities, including sonar training), and the preferred Alternative 2 (increasing training activities, sonar training, additional strike exercises and range enhancements). The Navy's analysis is devoid of geographic alternatives..." Providing only two action alternatives completely ignores the likelihood there could be better real time training outside of the proposed training areas and during different seasons -- options that could better fit the Navy's need to deal with both current and future threats.	Please see response to Laurie Ferguson – 6.

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Sierra Club Alaska Chapter - 6		The DEIS lists North Korea and Iran among present security threats. Both lack submarines able to travel underwater all the way from Asia or the middle east to our waters. It is our understanding that we have assets in place to extensively monitor their coast lines, observing all vessel traffic in or out of their ports. The likelihood is that submarine or other threatening activity would be spotted well in advance of approaching our waters. Why train in the Gulf of Alaska or other areas so far from the international waters in which such threats would likely be engaged? The Navy's stated purpose is to train to engage the enemy in the worst case scenario and they want to have joint training with the Air Force. This is a prudent objective. It seems. however, that the worst case scenario would be having to fight in the middle of the pacific during winter. Our planes and ships would need to travel far at speed under the harshest sea and weather conditions to engage the enemy. Training in the gulf of Alaska during less demanding seasons cannot duplicate those difficult circumstances. Clearly, the DEIS needs to consider additional training alternatives in order to meet the Navy's desire to be prepared for worst case threats to our security.	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included alternate locations. Such alternatives fail to meet the purpose of and need for the proposed action. The proposed area for Navy training in the TMAA is based on the mission of Alaska Command to support the needs of military forces within Alaska, forces deploying through Alaska, and joint training needs. Although U.S. Military forces are all-weather capable, training requires prudent safety precautions, such as avoiding extreme weather that adds little to the training value, but significantly increases risk to the participants. Even though windows of reasonably fair weather would be available in winter, rapidly changing conditions would certainly result in numerous event cancellations, resulting in very inefficient training.
Sierra Club Alaska Chapter - 7		2) Then there is the issue of better protecting Gulf of Alaska resources and the public health. Appendix A of the NRDC comments also points out that: "The DEIS fails to consider any alternatives beyond increasing the level of training. Therefore, many reasonable alternatives are missing from the Navy's analysis that might fulfill that purpose while reducing harm to marine life and coastal resources." Fortuitously, training during winter months, outside of presently proposed areas would not only prepare the Navy and Air force to better engage current and future threats but would be less environmentally harmful, especially to marine mammals. The Navy's justification for having deleted alternatives outside the proposed training area and train only during the summer is based on convenience. Convenience is not what is needed to prepare for meeting threats to our nation. Convenience can only lead to weakness.	Please see responses to Sierra Club Alaska chapter – 5 and 6. In addition, section 2.3.2 of the EIS/OEIS, Alternatives Eliminated from Further Consideration, addresses the fact that additional alternatives were considered but did not meet the purpose and need for training discussed within Chapter 1.
Sierra Club Alaska Chapter - 8		Appendix A of the NRDC comments summarizes Alaska Chapter conclusions with respect to these things very well: "In sum, the DEIS shortchanges or omits from its analysis reasonable alternatives that might achieve the Navy's core	This comment is duly noted. However, please note that the purpose of an alternative is not to "achieve the Navy's core aim to testing and training while minimizing environmental harm." Rather, proposed alternatives are alternative actions that

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		aim to testing and training while minimizing environmental harm. For these reasons, we urge the Navy to revise its DEIS to adequately inform the public of all reasonable alternatives that would reduce adverse impacts to whales, fish, and other resources." Sincerely, Mike O'Meara Sierra Club Alaska Chapter Conservation Committee	would meet the purpose of and need for the proposed action. Additionally, the Navy would like to point out that the broad objectives set forth in this document are both reasonable and necessary. In regard to studied alternatives, the Navy is in full compliance with NEPA. Please refer to Section 2.3 of the EIS/OEIS for further explanation of the alternatives selection process.
Bill Smith		The mammal density data I see presented in the draft EIS projects a density distributed over the entire exercise area. I am informed by Navy personnel that the observed whale activity is concentrated along the shallow side of the Aleutian trench. It would be more appropriate to depict, in a fine grained way, the observed mammal densities and then designate these areas for reduced or limited training activities. The same principle applies to the shallow areas where valuable commercial fisheries take place. There are many sea mounts in the training exercise area. Sea mounts are areas of special ecological significance and require extra levels of protection and wide protection zones. Although sea mounts are mapped in the draft EIS, no special consideration, protection or mitigation measures are designated in the draft EIS. I am aware of the PMAP system used by the Navy to avoid training in these areas, but I think the EIS should specifically define these areas as protected and that mitigation measures should expressly define such areas as off limits to training. Simply mentioning PMAP in the EIS does not incorporate such protections into the EIS.	Activities proposed within the TMAA have the potential to occur over the Aleutian Trench and sound energy from sonar may be present within the trench on occasion and the potential effects on marine species is detailed in Section 3.8 of the EIS/OEIS However, the probability of effect is uniform across the entire TMAA. The potential effects to resources are analyzed as a whole and effects to the trench are reflected in potential effects to the entire TMAA. Additionally, as provided in Chapter 5, mitigation measures will be implemented as appropriate whenever marine mammals are detected. In this manner, the Navy mitigation measures will afford the maximum protection to all marine animals, regardless of the species or area. Furthermore, the concept of geographical limitations is inconsistent with the requirements for training in the TMAA. Seamounts or areas of bathymetric relief are often used by submarines to hide or mask their presence, requiring the need to train in that complex ocean environment. If the Navy were restricted from training near sea mounts or areas of bathymetric relief, they may be unable to do so when faced with an actual threat.
Johanna Spicuzza		Alaskan waters needs protection. We cannot allow the waters to be polluted and the wildlife harassed or killed. Tell them go to an area they've already screwed up. The habitat is critical for whales and other wildlife.	The Navy shares your concern for marine life. Possible effects resulting from the proposed action were analyzed in the EIS/OEIS. Also, as described in the EIS/OEIS, the Navy implements protective measures during its training exercises. For additional information on alternate locations, please see response to Sierra Club Alaska Chapter – 6.
Phil St. John	Alaska Center for Appropriate Technology	Stay out of the Gulf of Alaska.	This comment is duly noted.
Todd Stafford		I support the Navy and other branches of the military conducting training exercises and other activities in the Gulf of Alaska. A strong military is vital to national defense and ongoing training is required. The men and women serving in our military deserve our gratitude and whatever support we may give them.	This comment is duly noted.

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Doug Stephens		Ok folks, Please pull your heads out of the dark hole it's buried in. You want to deafen the ocean with sonar and pollute it with toxic ordnance so that you can get ever more proficient at killing other people? We need protection from our own military more than we need military protection from any force getting ready to invade us from the pacific. What God do you believe in? What will you tell to your grandchildren when there are no marine mammals left? No fish left in the sea? Who is profiting from this venture? Certainly not our marine environment nor anyone who appreciates it or depends on it for their livelihood or well being, never mind the concept that these beings (marine mammals) have the right to peacefully exist by their own right. If this is ok with you, then, can I blast metal music out of enormous loudspeakers in the backyards of the military commanders and corporate CEO's who get off on sonar and ordnance? Can I do it until their ears bleed and they run screaming into the streets because they can't stand it any more? Can I dump toxic waste in their back yard too? Did your mother's not teach you to an iota of compassion when you were a little kid? Or, did mom say "Atta boy! Punch him again! Kick him in the nuts next time!" as you bullied the other kids on the playground. If you follow through with this you will be proclaiming to the world "I am a remorseless violent greedy bastard and proud of it!" My inquiring mind needs to know.	This comment is duly noted.
Bernadette Stewart - 1		As a former active duty Marine Officer, I understand the need for training to effect the ultimate security measures necessary to protect the nation. As a transplanted Alaskan and person who studies both sides of the issue, I have to say in this case the Navy's studies are flawed, and manipulated to justify these tests under very narrow circumstances. There is no scientific justification or rational presented that deals with the negative effects of these tests.	The Navy feels that the EIS/OEIS contained a thorough analysis of the effects of its proposed action using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. The Navy recognizes that the science of sound in the water and its effects on marine life is evolving. However, while additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. As such, any new information received via comments has been thoroughly analyzed and incorporated as necessary into the Final EIS/OEIS.
Bernadette Stewart - 2	Self	The protection boundaries are too narrow, and will not protect marine mammals, especially whales, other sea	As described in the EIS/OEIS, the Navy implements protective measures, that have been developed in conjunction with

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		wildlife and Alaska fisheries. I am opposed to the tests as presented by the Navy, and consider the Navy's science and research self-serving and totally inconsistent with valid scientific data, not to mention total ignorance of the Gulf of Alaska aquatic life, and the economy dependent on it.	NMFS, during its training exercises. It should be pointed out that the Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals, turtles, and sea birds. Please refer to Chapter 5 of the EIS/OEIS, Mitigation Measures, which presents the U.S. Navy's protective measures, and outlines steps that would be implemented to protect marine mammals and Federally listed species during training events. While the Navy is very confident in its well-trained lookouts, it does not expect that all animals present in the vicinity of training events will be detected. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate. Please see response to Stewart-1 above regarding scientific data.
Libby Stortz - 1		The US Navy's plan to perform sonic booms in the Gulf of Alaska from 4/10-10/10 will kill or maim 425,000 marine mammals, by you own estimation, every 5 years for a total of 925,000 animals. Migrating right whales and beaked whales, both endangered, will be among them. In addition your plans will kill or maim or otherwise negatively affect 2 million marine mammals worldwide every 5 years-a total of 10 million animals.	Sonic impacts have been discussed in Section 3.4; Acoustics and as they relate to marine mammals in Section 3.8. Additionally, the 425,000 number that you refer to has to do with "sonar exposures" and not sonic booms. Regarding the 425,000 sonar exposures, please see response to Judith Brakel – 1.
Libby Stortz - 2		Your military exercises at the same time-will increase air pollution 123 times and dump tons of toxic chemicals into our already stressed oceans.	The potential air pollution impacts of the Proposed Action were thoroughly evaluated in Section 3.1 of the EIS/OEIS. That analysis concluded that air pollution impacts of the Proposed Action would not substantially affect human health or the environment. Regarding expended materials, please see response to Alaska Glacial Mud Co. – 1. Additionally, please note that dumping is not practiced by Navy ships.
Libby Stortz - 3		The Navy's own mandate states that they are to mitigate and be stewards of the environment. There cannot be ANY security issue that necessitates a naval strategy that could cause such widespread destruction of the very oceans that our own very lives depend upon. What will be left to secure? Why bother? This is at the level of foolhardiness of Doctor Stranglove and his atom bomb. This is NOT how you protect a nation from terrorists or rogue states or anyone. This is	This comment is duly noted. Please note that as required by NEPA, the Navy used the best available scientific information to develop the analysis on sonar training and potential impacts to marine mammals for this EIS/OEIS. The Navy is a leader in funding marine mammal research to better understand them and to operate with the least possible impacts and it will continue to invest in marine mammal research.

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		how you create massive death for everyone. Please wake up! Get a clue!	
Ginger Strong - 1		I have worked on Alaskan waters for 12 years and these waters are essential to marine wildlife survival. I have researched marine wildlife for many of these years and there is no way to determine if marine life is within any vicinity of military research. Does not mean you don't see them that they are not there.	This comment is duly noted.
Ginger Strong - 2		Many species of marine mammals thrive on our rich waters and their lives depend upon this rich diverse ecosystem. Military trainings and sonar have proven to harm humans who's hearing is inferior compared to marine mammals. What right does the NAVY have in thinking that they can harass, harm or kill marine life for our benefit. I urge you to reconsider and to protect our valuable resources. We are already losing the Cook Inlet Beluga Whale and the Polar bears. Do we really need to add more species to the list. I will be at the hearings to also voice my opinion. Ginger Strong	Potential impacts of sonar on humans were discussed in Section 3.14.2.4 and determined to only be possible when humans are underwater and close to the sonar source. Due to the infrequency of diving activities in the TMAA and the location of training activities (over 12 nautical miles from the closest land mass), impacts on humans are not likely. As described in the EIS/OEIS in Section 3.8, the Navy is aware of the presence of marine mammals in the GOA TMAA area. The EIS/OEIS has detailed what is known regarding their hearing abilities. This section focuses on species likely to be present in the TMAA and Section 3.8.1.1 presents those species not likely to be present, such as Cook Inlet beluga whale; polar bear will not be present at sea in the TMAA. Please note that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The Navy's analysis indicates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
James Sutton - 1		Training in the sensitive waters of Alaska fails to balance the environment with the always omnipotent priority given to "national Security". Figure out other ways too maintain the level of readiness the Navy needs to use munitions and sonar without doing both proven and unknown harm to the rest of the world. National Security and the Navy are simply not the most important things there are.	This comment is duly noted. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
James Sutton - 2		One of the things that sports taught us at Annapolis was that "For practice, You use the practice fields or the fields that you had already messed up so bad that it didn't matter." You save the really good and important field for when it mattered; for when it was the real thing. When you watch "Avitar", the most popular movie in history, seen by more	This comment is duly noted.

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		Americans and tax payers that any other film, ever, do you recognize the US Navy and Marines in it? Will those that know that bombs and munitions and sonar are harmful recognize you? This is not a good idea for the Navy.	
David Swarthout		Please do not allow any further action on this initiative. I support minimizing the impact of Navy training on the fish and wildlife of the Gulf of Alaska(GOA), an environmentally sensitive area, and one that is critically important to all Alaskans. I especially oppose the use of sonar at potentially much higher levels than have been previously employed in the GOA; an area that is critical to the breeding of certain species of whales. Respectfully submitted, Dave Swarthout Homer, Alaska	The Navy shares your concern for wildlife in the Gulf of Alaska. The Navy disagrees that the proposed training and use of sonar will pose a significant risk to whales given that these same activities have been conducted for many years in other Range Complexes with no indications of any adverse impact to marine mammals, fish, or other wildlife. In addition, the Navy implements protective measures during its training events as developed with NMFS as a cooperating agency. In authorizations under the Marine Mammal Protection Act and Biological Opinions under the Endangered Species Act, NMFS has found these same training events will not pose a significant threat to marine life under their purview. The Navy will continue to implement the monitoring and research programs where training has been occurring to determine if there are determinable impacts as a result of those activities and will do so in the TMAA associated with future training occurring there. The Navy will continue to be a leader in funding of research to better understand the potential impacts of Navy training activities and to operate with the least possible impacts while meeting training requirements.
Karen Swartzbart - 1		What concern me most is the cumulative impact of extremely toxic missile and bomb residue polluting the ocean floor. The GOA is a biologically sensitive marine environment providing breeding, rearing, and migration habitat for all our commercial and non-commercial species.	The cumulative impacts analysis addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. The EIS/OEIS does more than simply compare activities; it analyzes in detail the effects of Navy actions on specific resources, and places those in the context of other sources of impacts. Regarding expended materials, please see response to Alaska Glacial Mud Co. - 1. Cumulative effects are addressed in Chapter 4 of the EIS/OEIS. The portion of Chapter 4 that addresses Expended Materials (Section 4.2.2) has been reviewed and revised, as necessary, to address the cumulative impact of expended materials constituents on the ocean floor.

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Karen Swartzbart - 2		These explosive contain depleted uranium and many other highly toxic chemicals that are known to be harmful to man and marine life. It would be like bombing a National Park.	With regard to depleted uranium, please see response to Ellen Americus – 2. With regard to "other highly toxic chemicals", please see response to Judith Brakel – 6.
Karen Swartzbart - 3		Please consider using your current training location. It seems unlikely that we can stand against the Navy and really make a difference. That being said, please consider a scaled down training exercise in the GOA that has less impact on the environment. Thank you for your time Karen Swartzbart	As explained in Section 2.3.2.1 of the EIS/OEIS, a relocation of training activities would not support the Navy's Purpose and Need and was therefore eliminated from further consideration. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Steven Swartzbart		I am a student of Cordova Jr/Sr High School. Half the kids in my class have parents that fish or have fishing related jobs. In some oceans the water has changed 2 degrees and the whole Marine ecosystem was thrown off. What do you think would happen if you put waste from bombs in Ocean that many people live off of. Please reconsider other options for Navy training activities in the GOA. Thank you Steven Swartzbart	Socioeconomic impacts in regard to the fishing industry, tourism and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. Regarding expended materials, please see response to Alaska Glacial Mud Co. - 1.. Please note that the analysis presented in the EIS/OEIS indicates that expended materials remaining in the TMAA would not affect the food chain and would not pose a reasonable risk to the public.
Robert Sylvester		I support the no action alternative. Protection of the marine mammals which the Navy acknowledges is more important than giving the Navy carte blanche to operate whenever and where ever it wants. The Cold War is over. The Navy can (with a bit of inconvenience) test all its capabilities satisfactorily without damaging the environment that we are all stewards of. Others have spoken to the scientific reasons why this alternative is the only one acceptable. The damage to very rare and important marine mammals that will result from the action alternatives is unacceptable. Thank you.	This comment is duly noted, however, the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Please note that the science of sound in the water and its effects on marine life is evolving. With that said, the Navy has used the best available science in preparing this EIS/OEIS. Additionally, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Forest Taipale - 1		The Navy doesn't analyze environmental impacts. It disregards the serious impacts that sonar training will have on endangered Pacific whales whose critical habitat is only 12 nautical miles away.	The Navy complies with all applicable environmental laws, including NEPA and its requirements. Additionally, with regard to protecting marine mammal habitat, the boundaries of the TMAA were adjusted to avoid the designated Critical Habitat for Steller sea lions and the North Pacific Right Whale. As presented in Section 3.8 and depicted on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA. In

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			addition, please see Chapter 5 detailing the Navy's standard protective measures developed in cooperation with NMFS which will provide additional protection to marine mammals detected in the vicinity of sonar training events.
Forest Taipale - 2		It fails to discuss cumulative effects it activities may have.	The cumulative impacts analysis (Chapter 4) addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. The EIS/OEIS does more than simply compare activities; it analyzes in detail the effects of Navy actions on specific resources, and places those in the context of other sources of impacts.
Forest Taipale - 3		I'm sure all the technology the USA has is fine for underwater war, I don't think we need to develop more sophisticated weapons that kill everything in their path. Thank you for your time.	This comment is duly noted.
The Observatory, ABAA - 1		The proposed use of sonar in an area where endangered whales, known to use their own sort of sonar for identifying prey, is downplayed to a laughable extent in your EIS. Much is made of the effects of airplanes, rockets, etc., all of which will be fired in the air, but almost nothing on the effect in the water.	The Navy acknowledges that sonar impacts are an issue of concern to the public. Therefore, this EIS/OEIS gives a serious and thorough analysis of potential effects of sonar on marine mammals. Much of Section 3.8 is devoted to the science of sonar and impacts to marine species, and App. D, E, and F give further information on the Navy's analysis and marine mammals.
The Observatory, ABAA - 2		I will not go into the necessity for having these training exercises at all, although it is hard to think of any country willing now or in the future to take on the U.S. Navy, since I am not a military person. How expensive will all of this be? Since our economy is in trouble, why should we spend money so the navy can play at war? But I am a person who is deeply concerned with the effects on endangered species. Please re-think your program. Sincerely, Dee Longenbaugh	This comment is duly noted.
DeWaine Tollefsrud - 1		As a professional whale watching guide and educator making a living in the Gulf of Alaska and lower Cook Inlet, I am writing this letter of great concern over the current proposal by the Navy to use this delicate ocean eco-system, some of the most productive waters in the world, to do massive military testing.	This comment is duly noted. Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. As stated above, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment. Please note that the total duration for Navy training activities, under the Preferred Alternative, would be up to six weeks a year out of 52 weeks.

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DeWaine Tollefsrud - 2		The Gulf of Alaska, one of the richest fisheries in the world, is the summer feeding grounds for literally thousands of marine mammals including Gray Whales, Humpback, Blue, Sei and Fin whales. These whales, including the smaller species, like killer whales and harbor porpoises, are extremely sensitive to sound, and communicate, navigate and hunt using sonar. The use of high powered Navy sonar could seriously harm these species!	The Navy shares your concern for marine life. As detailed in Section 3.6 for fish and 3.8 for marine mammals, Navy is aware of the species likely to be present in the TMAA. The Navy disagrees that the proposed training and use of sonar will pose a significant risk to whales given that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The Navy's analysis indicates and this history indicates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. In addition, the Navy implements protective measures during its training events as developed with NMFS as a cooperating agency. In authorizations under the Marine Mammal Protection Act and Biological Opinions under the Endangered Species Act, NMFS has found that these same training events will not pose a significant threat to marine life under their purview. The Navy will continue to implement the monitoring and research programs where training occurs to determine if there are impacts as a result of those activities and will do so in the TMAA associated with future training occurring there. The Navy will continue to be a leader in funding of research to better understand the potential impacts of Navy training activities and to operate with the least possible impacts while meeting training requirements.
DeWaine Tollefsrud - 3		Navy representatives have stated that "mitigation techniques" (lookouts and other sight-based techniques) would be sufficient to "reduce" the number of animals severely impacted by these exercises. As a professional whale spotter I can tell you that spotting even a Fin Whale, second largest animal in the world after the Blue, with it's 30+ foot spout, can be nearly impossible in the weather conditions present in the Gulf during the summer months, let alone from the deck of a fast moving vessel.	Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. In addition, as noted in the EIS/OEIS in Section 5.2.1.2, all Navy surface ships participating in anti-submarine warfare exercises will have two additional personnel on watch as marine mammal lookouts. While the Navy is very confident in its well-trained lookouts, it does not expect that 100% of the animals present in the vicinity of training events will be detected. The acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided. Please note that Naval vessels have a higher height of eye than most fishing vessels as well as having multiple vessels

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			over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space. The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate.
DeWaine Tollefsrud - 4		In addition to sonar, this is not the appropriate place to be dumping hundreds of thousands of pounds of expended material, especially the expected 10,300 pounds of hazardous waste!	Dumping is not practiced by Navy ships. With regard to expended materials, please see response to Alaska Glacial Mud Co. - 1.
DeWaine Tollefsrud - 5		It has been documented that there has not been satisfactory research done to determine that testing will not be harmful to marine wildlife, their feeding areas, migratory routes, and fragile habitats. Instead of ignoring scientific studies and public outrage, the American government needs to protect this great treasure.	Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Additionally, the science of sound in the water and its effects on marine life is evolving. With that said, the Navy conducted a thorough analysis of sonar and underwater detonations in the EIS/OEIS, using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species.
DeWaine Tollefsrud - 6		If the only options are "business as usual," or increased testing, or even more increased testing, then the action needs to be "business as usual." Please, do not increase Naval exercises with its attendant toxic dumping or use of sonar! And, if we want to protect our nations' future marine-based prosperity, we need to reduce such activities.	Please see response to Laurie Ferguson – 6. Additionally, the decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Jane Tollefsrud - 1		Being an educator who has lived at the edge of the Gulf of Alaska for over 30 years, I am writing this letter of great concern over the current proposal by the Navy to use this delicate ocean eco-system, abundantly full of marine life, to do massive military testing. THIS CANNOT HAPPEN!	Please see response to DeWaine Tollefsrud - 1 above.
Jane Tollefsrud - 2		The Gulf of Alaska, one of the richest fisheries in the world, is no place to be dumping hundreds of thousands of pounds of expended material, especially the expected 10,300 pounds of hazardous waste!	Please see response to DeWaine Tollefsrud - 4 above.

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Jane Tollefsrud - 3		The Gulf of Alaska is home to a wide variety of whales, including, but not limited to, endangered species such as the gray whales, humpback, blue, and North Pacific right whales. Whales, including the smaller species, like orcas and harbor porpoises, are extremely sensitive to sound, and communicate, navigate and hunt using sonar. The use of Navy sonar could threaten and endanger some species!	Please see response to DeWaine Tollefsrud - 2 above.
Jane Tollefsrud - 4		There has not been satisfactory research done to determine that testing will not be harmful to marine wildlife, feeding areas, migratory routes, and fragile habitats. Instead of ignoring scientific studies and public outrage, the American government needs to protect this great treasure- the Gulf of Alaska is one of the last pristine and productive bodies of water in the world!	Please see response to DeWaine Tollefsrud - 5 above.
Jane Tollefsrud - 5		If the only options are "business as usual," or increased testing, or even more increased testing, then the action needs to be "NO action." PLEASE DO NOT INCREASE Naval exercises with its attendant toxic dumping or use of sonar! And, if we want to protect our nations' future marine-based prosperity, we need to reduce such activities. Thank you for your time and consideration.	Please see response to DeWaine Tollefsrud - 6 above.
Turning the Tides - 1		The ocean is in fragile health. Ocean scientists often refer to their work as "documenting the decline". If we are to survive, we must stop contributing to the demise of the ocean. We have dumped millions of tons of poisons into the ocean. Sea mammals can now be legally classified as "toxic dumps". There are thousands of "dead zones" where nothing grows, the largest, thousands of square miles. We are finding fish with cancer. The ocean provides food and according to Dr. Sylvia Earle, up to 85% of the world's oxygen. What are we thinking?	The Navy shares your concerns about the fragility and health of the ocean. The Navy does not dump toxic pollutants into sensitive marine protection areas. In fact, dumping is not practiced by Navy ships.
Turning the Tides - 2		Sonar testing will harm thousands of already stressed ocean mammals. We must stop using the seas and the life within them as toxic dumps - to do with as we please. The greatest threat to the United States - and to the planet - is an irretrievably damaged ocean. Please consider if further dumping and sonar testing are furthering the demise of the ocean. At the least, please use the no action alternative.	The Navy shares your concern for marine life and the health of the ocean. Dumping is not practiced by Navy ships. With regard to sonar, the Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. The Navy's analysis indicates there is little relative risk to populations of marine mammals from sonar training exercises. The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Therefore, mitigation and monitoring

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			are implemented to further reduce impacts. Also, note that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that cause adverse biological impact to marine mammal population stocks at those locations. Because there is no indication from areas where the Navy routinely trains that training activities have a negative impact on the health of the marine environment, the Navy is confident that there is little relative risk to marine mammal populations from active sonar training or any other training events. Regarding alternative selection, please see response to James Clare – 2.
Taylor Waters		Please do not open water blast or use sonar anywhere that marine mammals will be affect, Go offshore, far far offshore during the winter. Extra training, cold weather, extreme weather, and safer. I know the rest of the government is irresponsible, but that doesn't mean you guys have to be.	As explained in Section 2.3.2.1 of the EIS/OEIS, rescheduling training activities to a different season would not support the Navy's Purpose and Need and was therefore eliminated from further consideration. The extreme weather conditions during the non-summer season would either needlessly jeopardize participants' safety, or would be very inefficient due to likely rescheduling of numerous events not completed during bad weather. Although U.S. Military forces are all-weather capable, training requires prudent safety precautions, such as avoiding extreme weather that adds little to the training value, but significantly increases risk to the participants. Even though windows of reasonably fair weather would be available in winter, rapidly changing conditions would certainly result in numerous event cancellations, resulting in very inefficient training. Additionally, please note that that Navy training exercises already use, to a large extent, computer-simulated training and conduct command and control exercises without operational forces (constructive training) whenever possible. However, as described in Section 2.3.2.4 of the EIS/OEIS, "Unlike live training, simulated training does not provide the requisite level of realism necessary to attain combat readiness, and cannot replicate the high-stress environment encountered during combat operations." This section and Section 1.2.1 - "Why The Navy Trains," goes further to explain the importance of live training and the current limitations of simulated training.

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Jane Wiebe		In the interest of protecting our fish and marine mammals, I support the "No action" alternative. I am an Alaska resident, and believe in the importance of protecting these natural resources. Thank you.	Regarding alternative selection, please see response to James Clare – 2.
Name Withheld – 1		While military readiness is vital to the security of our country, bombing exercises planned in the Gulf of Alaska will harm an extraordinary number of marine mammals, fish and other wildlife including 7 endangered species. Environmental impacts have not been properly analyzed, particularly in regard to the impacts of sonar on marine mammals and the density estimates needed to understand these impacts.	Section 3.8.2 in the EIS/OEIS discusses the density estimates used in the EIS/OEIS analysis with more detail provided in Appendix E. These estimates and the method for analysis were coordinated with National Marine Fisheries Service (NMFS) as a cooperating agency. In addition, in April 2009 the Navy funded and NMFS conducted the Gulf of Alaska Line-Transect survey (GOALS) to address the data needs for additional information. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 for full discussion on the survey. Please note that the Final EIS/OEIS is an extensive and exhaustive study based on research and analysis of the effects of increasing training activities on marine resources. While additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. Given the natural variation of marine mammal locations over time within the Gulf of Alaska, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that there is little documented scientific information demonstrating broad-scale impacts that are either injurious or of significant biological impact to marine mammals, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Furthermore, Section 3.8 (Marine Mammals) and Section 3.6 (Fish) of the EIS/OEIS thoroughly analyze impacts to both marine mammals and fish from proposed Navy training activities. The EIS/OEIS concludes that there is no significant impact to population levels for either marine mammals or fish.
Name Withheld – 1-1		Protection measures are inadequate in terms of considerations given to the harbor porpoise, the grey, humpback, and blue whales migrating through the area.	As described in the EIS/OEIS, the Navy implements protective measures during its training exercises. The Navy's protective measures, which were developed in coordination with the National Marine Fisheries Service, are effective at mitigating, not eliminating, risk to marine mammals. Based on the

ID	Organization	Public Comment (Website)	Navy Response
			analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate. Please see Chapter 5 of the EIS/OEIS, Mitigation Measures, for the Navy's protective measures, which outlines steps that would be implemented to protect marine mammals and Federally listed species during training events.
Name Withheld – 1-2		Alternatives do not include investigation of other places to go bomb that may have considerably fewer impacts.	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.
Name Withheld – 1-3		The destruction of marine wildlife, the hazardous waste left by expended ordnance, and the sheer magnitude of the unknown impacts added to the impacts already known, lead me to personally request that the Navy explore alternatives where the impacts to wildlife are known, the impacts are far less and the exercises will be still be effective for military readiness. In short - not in the Gulf of Alaska.	The Navy shares your concern for marine life and all of the concerns you identify were analyzed in the EIS/OEIS. Also, as described in the EIS/OEIS, the Navy implements protective measures during its training exercises. As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.
Name Withheld – 2		We cannot eat bombs. Our national security and foreign relations policies are seriously flawed. What we need is food and energy security -- NOT achieved by damaging ecosystems and invading other countries to get their oil. If we would conserve our resources, use organic methods of food production, develop renewable energy, become more energy efficient, and play fairly with other nations, our future will not only be more secure, but a heck of a lot healthier and happier. It's time the military stopped being the tool of those who seek domination and control. Please! I'm praying for you.	This comment is duly noted.
Name Withheld – 2-1		In my last comment I forgot to say directly that I am against increasing military training activities in the Gulf of Alaska. The environmental damage will be too great. You need to rethink your priorities. Focus on peacekeeping and conflict resolution and respect for human rights everywhere--not just U.S. citizens. All life is sacred. All humans made in the image of the Creator. Be life respecters, not destroyers. Thank you for the opportunity to comment.	Please see responses to James Clare – 2 and Ellen Americus - 1.

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Name Withheld – 3		This is a great opportunity for Alaska. The modern sonar and radar devices, can determine were marine life is so it could avoid any problems. Doing this exercise in the winter is crazy. Any Alaskan knows the conditions out there during that period and it would be more of a survival type of training and not beneficial to the Navy. I've spent 40 years with the Navy, Coast Guard, and Army, most in Alaska and winter training never really produced good results, we did learn how to survive in Arctic Conditions, but the training we really need as to how to fight sometimes suffered.	This comment is duly noted.
Name Withheld – 4		the overall environmental safety record of military activity here in Alaska is a dismal one. at last count there were already over 1200 FUDS sites still waiting for cleanup. these were leftover from the first days of military presence here in Alaska in the 40's.	Past military practices and historical contamination sites are beyond the scope of the EIS; they are not associated with the Proposed Action. With regard to the cumulative impacts addressed in Chapter 4 of the EIS/OEIS, any contamination of bottom sediments or the water column in the GOA from these sites is reflected in the description of the current condition of the marine environment and marine resources that inhabit the GOA.
Name Withheld – 4-1		I am certain there are other optional training sites where these exercises could take place and just as certain that wherever it is the cleanup will be minimal. in light of this fact alone and the pertinent fact that the gulf of Alaska is just one of many Alaskan traditional fishing grounds which is newly certified sustainable by the marine mammals council, I strongly urge the navy to look elsewhere in planning military exercises for this and future years.	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action. Certifying fisheries as sustainable relates to appropriate fisheries management. The Navy is not involved in fishery management; however, this EIS/OEIS does address potential socioeconomic impacts of the proposed action on fisheries in Section 3.12 and the biological impacts to fish in Section 3.6.
Name Withheld – 4-2		Fishing will go on forever as long as there is something to fish for. dumping over 500,000 tons of toxic waste, derelict vehicles, and petroleum byproducts per year into one of the world's most pristine fisheries hardly seems like sustainable behavior.	Under the Proposed Action, the Navy would not dump over 500,000 tons as indicated by the commenter. Regarding expended materials, please see response to Alaska Glacial Mud Co. - 1. Please note that the analysis in the EIS/OEIS indicates that hazardous materials would be quickly dispersed by ocean currents to non-toxic concentrations, and would not be expected to adversely affect marine organisms.
Name Withheld – 4-3		when considering the addition of sonar testing to the mix, one must consider the consequences to fisheries habitat and migratory patterns.	As was described in Sections 3.6.1.4, fish have very limited hearing in the frequency range of Navy sonar, and the body of research indicates they are not negatively impacted by Navy sonar. Additionally, as presented in Section 3.6, there will be no impacts to fish populations or to fish in migratory routes, such as noted on page 3.6-14 for example. Please note that there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of fish

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			populations. As such, the Navy is confident, and the analysis indicates, that its training activities will not impact the fisheries off the Gulf of Alaska.
Name Withheld – 4-4		I have a strong military history in my family and i do appreciate the need for training. without the necessary protections for our fishing environment, and indeed protection and preservation of the future of fishing off the entire coast of Alaska, I am not going to condone the types of military exercises you are proposing for the gulf. please seek alternatives.	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action. Additionally, as mentioned above, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of fish populations.
Name Withheld – 4-5		I appreciate the facility of commenting, however, a character count and a copy of the comment sent to the commenter would be a nice addition to the comment feature.	The Navy appreciates your feedback. We continue to look for ways to improve the public's ability to be heard on these matters, and will consider your suggestion as a way to improve the website's functionality.
Name Withheld – 5		I am 91 years old and I believe in Life!! I do not believe in killing any living creature. The oceans are full of life and my reason for being a long time vegetarian to aviod having any creature being killed on my behalf. The oceans are full of life! How could you practice bombing and not killing? I am against -strongly-any practice which kills living creatures, especially in the ocean and its surroundings. I once supported the military because I believed that we were preventing death but now I have seen that we need to mend our ways and negotiate and learn new ways toward peace.	This comment is duly noted.
Name Withheld – 6		I'm all for the training of the sonar to detect submarines. We must protect and keep our country safe. If this is the most reliable way to do it, then I'm for it! Thanks	This comment is duly noted.
Name Withheld – 7		I have lived in Alaska for over 45 years and am a retired commercial fisher. I have seen many things happen in Alaska that harm the environment and the people and animals living here. This proposed training in the Gulf of Alaska will be yet another of these harmful, unnecessary undertakings that will harm whales and marine mammals. It is a proven fact that sonar disrupts and harms the lives of marine mammals and should not be done in Alaska. Many people enjoy the whales and marine mammals and subsist on the same.	This comment is duly noted. Please also note that Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. The Navy recognizes the multitude of value placed on the GOA resources, and has established mitigation measures to protect these resources. Please see Chapter 5 of the EIS/OEIS.

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Name Withheld – 7-1		Right whales are on the brink of becoming extinct and doing any sonar testing in the Gulf of Alaska would certainly harm any chance they have or making any kind of recovery. The Navy should not take the chance that whales and marine mammals could be killed.	A discussion of potential impacts to North Pacific right whales from sound sources proposed for use in the TMAA is presented in Section 3.8 of the EIS/OEIS. In addition, it should be pointed out that the Navy has conducted mid-frequency and high-frequency active sonar activities for decades with no indications of injuries to resident beaked whales at training ranges in Hawaii and Southern California or to right whales on the East Coast. There are no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Name Withheld – 7-2		The exercises could be done elsewhere where no whales frequent. I encourage you to adopt Option one.....take no action. Please be responsible and conduct your training elsewhere. Listen to the people of Alaska and do not train here. Thank you for the opportunity to comment. Sincerely,	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.
Name Withheld – 8		I personally do not approve the use of Sonar for testing. I just moved here from Seattle, and the media has covered a few instances where marine life has washed up on shore dead immediately following USN sonar testing. On every occasion, the Navy has declined to comment on the situation. Alaska's marine fisheries are already stressed to the point that economic disasters have been declared.	The proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Given the natural variation of marine mammal location over time within the GOA TMAA, operational variability of Navy mid-frequency and high-frequency active sonar operations, and the fact that the Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Also, please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding situations across the world, and includes the Navy's input on each situation.

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Name Withheld – 8-1		Further, Alaska proves to be a rich and vibrant habitat for whales and other large marine mammals. It is my understanding that their hearing is far better than ours, and subsequently far more sensitive.	As presented in Section 3.8 of the EIS/OEIS, information has been presented regarding the project area as a habitat for the various species of marine mammals likely to be present there and also provides the details regarding what is known about the hearing capabilities for each of those species.
Name Withheld – 8-2		Thank you for telling us there are safeguards, but share with us what they are specifically.	Please see Chapter 5 of the EIS/OEIS, Mitigation Measures, which presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events.
Name Withheld – 8-3		I appreciate how the Navy protects and defends the American constitution and our way of life. But I think testing can be done somewhere else on this planet. After all, the world is 3/4 ocean.	The proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.
Name Withheld – 9		US Navy: I support the use of sonar and the live-fire exercises scheduled for the Gulf of Alaska. The use of drills and live-fire exercises are necessary for the Navy to be prepared to protect America and her interests in the world. Sterling, Alaska	This comment is duly noted.
Name Withheld – 10		To think there is an acceptable number of "takes" from sonar exercises so we can be "safe" is so far from human goodness.	This EIS/OEIS uses a method for calculating exposures to underwater sound that was developed jointly by the Navy and the National Marine Fisheries Service. This method for evaluating "takes" of marine mammals is a term used to indicate the level of harassment, either A or B, under the Marine Mammal Protection Act; the term does not reflect a marine mammal death.
Name Withheld – 10-1		And what is being protected? The same thing that is provoking. Corporate greed in other countries, US and corporate backed political takeovers, abuse of humanity and the earth for profit. If the US government said absolutely not to corporate, banking and military industrial pressures, it might be smiled upon by those in the world and there would be not "need" to commit sonar exercises.	This comment is duly noted.
Name Withheld – 11		PLEASE find another place to do your training and developing. Alaska's marine life already has enough challenges. Does the term "endangered species" mean anything to you?	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving training to other locations. Such alternatives fail to meet the purpose of and need for the proposed action. Additionally, the U.S. Navy is in full compliance with the Marine Mammal Protection Act, the Endangered Species Act, NEPA

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			and all other federal requirements. For information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.
Name Withheld – 12		The proposed training in the Gulf of Alaska should not proceed. The most vulnerable species in the area, the Northern Right Whale, is on the Federal endangered species list. The danger posed to these animals from active sonar used/being tested by the Navy is well known and is still dangerous and disrupting to marine mammals from well over the 200 yard limit rule.	A discussion of potential impacts to North Pacific right whales from sound sources proposed for use in the TMAA is presented in Section 3.8 of the EIS/OEIS. In addition, it should be pointed out that the Navy has conducted mid-frequency and high-frequency active sonar activities for decades with no indications of injuries to resident beaked whales at training ranges in Hawaii and Southern California or to right whales on the East Coast. There are no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Finally, it should be noted that the Navy is in full compliance with the Marine Mammal Protection Act and the Endangered Species Act. For more information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.
Name Withheld – 12-1		I don't believe that we need to add this kind of certain destruction to the long list of environmental catastrophes in the region. Fisheries are declining, oil spills are frequent and we are at risk of losing valuable economic and tourism resources. Please find an alternative.	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the EIS/OEIS, the Navy is confident that its training activities will not impact commercial and recreational fisheries off the Gulf of Alaska. Analysis of impacts to fish are found in Section 3.6 of the EIS/OEIS. Socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. To help manage competing demands and maintain public access in the GOA, the Navy conducts its offshore activities in a manner that minimizes impacts to recreation and commercial activities.
Name Withheld – 13		It is a proven fact (information distributed by the US Gov.) that noise will disturb the cycle of life for all species. If we are to ruin our fisheries so that our soldiers can better kill, what good could come of it? If our food supplies are diminished the military will not be able to repair the damage. And it is not their job, so the people they are fighting for will be further destroyed due to food shortages. We have been destroying habitat for as long as I am alive(62 yrs) and there is no end to the amount of damage our military has done to the planet. We have no way of bettering our oceans or any	This comment is duly noted.

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		other waterways and for this reason I feel it imperative that we DO NOT allow anyone to cause harm to our food sources or our water.	
Name Withheld – 14	Alaska Charter Association	I am totally against the Navy doing any bombing or training in the Gulf of Alaska, Cook Inlet or Bays and Passages of Alaska. Our waters are pristine and we would like to keep them that way. Setting off any type of detonations will affect all life in the ocean, not only on the bottom, but all levels. The noise alone would hurt certain species of mammals and fish. Please, keep the Navy away from Alaska!!	There are no activities proposed in Cook Inlet or waters that could be considered "bays or passages of Alaska". As per Chapters 1 and 2 of the EIS/OEIS, with the exception of Cape Cleare on Montague Island located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore; the location of the TMAA has been chosen as a location adequate for training and for the least possible effects to designated habitats. The Navy fully analyzed potential impacts to marine life, including impacts from bombing and in-water detonations as presented in Chapter 3 of the EIS/OEIS.
Name Withheld – 15		Aren't our natural resources endangered enough without purposely bombing them? I strongly urge you to reconsider this plan. I realize training is essential, but so are our natural resources.	The Navy fully analyzed potential impacts to the marine environment, including impacts from bombing and at sea explosions. The findings are in Chapter 3 of the EIS/OEIS.
Name Withheld – 16		I have been a commercial Fisher in Cook Inlet Alaska for 33 years. In the 70's and 80's I would see hundreds of Beluga whales swim and dive past 400+ salmon drift gillnets AND NEVER TOUCH A NET. Now the EPA allows "exceptions" for toxic drilling mud dumping from the oil platforms in Cook Inlet and the city and State offer no resistance to unfettered development in the Anchorage bowl: untreated storm water dumping into Upper Cook Inlet. So now the Cook Inlet Beluga whale is listed as endangered, and I haven't seen a whale in many years. Does the Navy believe that it is already so messed up in Cook Inlet that further destruction doesn't matter? I am going to be significantly restricted in my ability to make a living in Cook Inlet due to restrictions on my commercial fishing activity. I cannot understand why the Navy can ignore the responsibility to restrict THEIR activity in the interest of accommodating the recovery of not only Beluga whales, but the previously-healthy ecosystem of Cook Inlet.	No proposed Navy training would occur in the Cook Inlet. Cook Inlet does not fall within the action area of the Proposed Action. As stated in Chapters 1 and 2 of the EIS/OEIS, with the exception of Cape Cleare on Montague Island located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore; far from the Cook Inlet.
Name Withheld – 17	Prime Select Seafoods, Inc	I disagree with any increase in the military discharging more ammunition or other contaminants into the Gulf of Alaska. Training is fine but, please do not pollute the Gulf any MORE. Our whole town of Cordova, our community, our	Regarding expended materials, please see response to Alaska Glacial Mud Co. – 1. Additionally, please note that the Navy has installed technology aboard ships to keep plastics out of the ocean and safely manage our biodegradable waste

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		businesses and our homes and lives rely on the fact that we have an intact healthy ecosystem still able to produce natural wild fish runs. With world pollution already impacting the Gulf and with continued oil spills etc., we need to be very careful about what we intentionally discard into those waters. Isn't there any way to train without increasing the discharge into the Gulf? I really think the military could come up with something cleaner to use for training purposes. Thank you for taking public comment on this matter.	stream. The Navy takes its responsibility seriously to serve as a good steward of the natural environment. The Navy demonstrates that commitment by investing millions of dollars annually in programs that minimize, and in some cases eliminate, the effects of activities on the environment while carrying out the ongoing national defense mission.
Name Withheld – 18	Fishermen's Wharf	Hello; Thank you for your postcard. I had a concern about training off the coast of Oregon during the summer due to our Tuna season. Your card said you will train in Alaska and I thank you for that. I hope all is a success. I myself am ex-military. Again keep up the good work and God Bless you.	This comment is duly noted.
Name Withheld – 19		I realize that live training is thought to be necessary. However, when you compare the value of live training to the value of the natural resources and marine life in the Gulf of Alaska, I firmly believe that the integrity of the environment takes precedence over live training exercises. There, I do oppose the practice and ask you to find ways to simulate training without discharge of toxic ammunition and without disturbing wildlife. Thank you for your consideration.	As described in Section 2.3.2.4 of the EIS/OEIS, “Unlike live training, simulated training does not provide the requisite level of realism necessary to attain combat readiness, and cannot replicate the high-stress environment encountered during combat operations.” This section and Section 1.2.1 - "Why The Navy Trains," goes further to explain the importance of live training and the current limitations of simulation. Regarding expended materials, please see response to Alaska Glacial Mud Co. - 1.
Name Withheld – 20		I support the no action alternative. I am concerned with the impact the sonar testing will have on marine mammals in the Gulf of Alaska. I am concerned that sonar will disrupt endangered species like humpback, gray, blue, and northern pacific right whales that are already having difficulties supporting healthy populations. I have concerns that safe areas have not been created to offer protection from sonar and bombing to give these animals a place of refuge from testing.	The proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Please note that the U.S. Navy has conducted active sonar activities for decades with no documented proof of injuries to marine mammals. Given the natural variation of marine mammal locations over time within the GOA TMAA, operational variability of Navy active sonar operations, and the fact that there is little documented scientific information demonstrating broad-scale impacts that are either injurious or of significant biological impact to marine mammals, the Navy’s analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Additionally, the boundaries of the TMAA were adjusted to avoid the designated Critical Habitats. As presented in Section 3.8 and depicted on Figure 3.8-1, the North Pacific right whale

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			Critical Habitat is approximately 16 nautical miles from the nearest corner of the TMAA. In addition, gray whales will generally be found near the coastal areas whereas the closest point of the TMAA is over 12 nautical miles from the nearest coast line. While blue whales could be present in the TMAA, the best available science indicates their presence will be rare in the area and it is therefore unlikely that Navy training activities would occur when they are present.
Name Withheld – 20-1		Furthermore my community depends on fishing for the lion's share of it's economy. It's our lifeblood. The testing of munitions has no place in the rearing grounds of our food and livelihood. I am deeply concerns with the dumping of hazardous waste associated with the testing of munitions. The Gulf of Alaska is too important as a rich fisheries breeding ground to be used as a bombing range. In Cordova, our lives depend on the fisheries that come directly from the sea. Disruptions in our ecosystems send ripples throughout the food chain and can have no positive effect on the health of our fisheries populations. Please do not risk the health of endangered marine mammals and fish for the testing of military equipment.	As stated in previous responses, dumping is not practiced by Navy ships. The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the EIS/OEIS, the Navy believes that its training activities will not significantly impact fisheries off the Gulf of Alaska. Analysis of impacts to fish are found in Section 3.6 of the EIS/OEIS. In summary, the EIS/OEIS examined potential impacts to fish and fish habitat due to vessel movement, aircraft overflight, weapons use, expended training materials, in-water detonations, and sonar. In each case, proposed Navy training is expected to result in possible minimal impacts to individual fish, but no population level impacts.
Name Withheld – 21		It is about time we start caring about the marine life that thrives around my home. The salmon that swims in these waters is what feeds me through the winter. Without food a human cannot survive. I can survive however without bombs in my water, excess fuel, and many other pollutants that you somehow don't care about dropping into the our waters. Perhaps you don't live in Alaska. If you did I would hope you would want to save what lives in these beautiful waters. We cannot continue to act ignorant about what the navy's actions are doing to our waters. The dangers are real and even if you killed one whale, that is too many. Do not take these unforgivable actions. When all the water is polluted not only will all our marine animals die, but so will we. Think of your children and grandchildren and imagine them never seeing a clean ocean and know you destroyed it. It's time for the navy to use their so called intelligence and make a change we can all live with. Thank You	The Navy takes environmental stewardship very seriously and has been and will continue to be a leading sponsor of marine mammal research. The Navy provides a significant amount of funding and support to marine research. In the past five years the agency funded over $100 million ($26 million in FY08 alone) to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals. For additional information on Navy research efforts, refer to page 5-20 of the Draft EIS/OEIS. Additionally, the Navy's protective measures are effective at mitigating, not eliminating, all risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals and other species at those locations, it is not likely that any additional risk posed by the proposed activities will have any significant impact on species in the TMAA.

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Name Withheld – 22		I have fished commercially in the North Gulf of Alaska, since 1974. I do not see the need for the US Navy to conduct sonar operations in this area. I have also heard that they plan to dispose of hazardous waste in this area. Now that is uncalled for. I strongly oppose any type of Navy operations that have the potential to negatively impact the marine mammals and fish in this area.	The Navy's need to conduct training in the Gulf of Alaska is outlined in Chapter 1 of the EIS/OEIS, primarily in Sections 1.2.2, and 1.4. The potential impacts of the proposed training are analyzed and explained in Chapter 3. The Navy has no plans to dispose of hazardous wastes in the Gulf of Alaska.
Name Withheld – 22-1		In fact it is time that the military stops wasting vital energy, money and man hours on operations that no longer make sense. Attacks will come by single people not by large military foreign operations. Also close down the Bangor sub base in the State of Washington. We no longer need to hunt for the "Red October".	The Bangor sub base in Washington State is not within the scope of this EIS/OEIS. Each nation has its own training needs based on that nation's forces, capabilities and missions. Anti-Submarine Warfare (ASW) training remains one of the Pacific Fleet's (and the Navy's) highest priority requirements. As such, the ability to conduct ASW around varying underwater topography is critically necessary in order to fight the growing submarine threat.
Name Withheld – 23		I support the no action alternative which will allow existing training activities in the Gulf of Alaska to continue but which will not increase toxic dumping or entail the use of sonar harmful to whales and fish. Military readiness should not come at the expense of degraded water any harm to marine life. I am against the use of sonar in any case!	This comment is duly noted. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process. Please note that the Navy does not conduct toxic dumping and that the Navy has conducted active sonar activities for decades in oceans all around the world with no documented proof of injuries to marine mammals. Given the natural variation of marine mammal locations over time within the GOA TMAA, operational variability of Navy active sonar operations, and the fact that there is little documented scientific information demonstrating broad-scale impacts that are either injurious or of significant biological impact to marine mammals, the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Name Withheld – 24		there is very much a significant adverse effect on birds, fish and all wildlife when the us navy moves into an area.the us navy owns numerous other sites which can and are used for training. they do not need to be in every site polluting the place. every single site the us navy uses is a pollution pit. that means keep them out. they have no right to kill fellow Americans with their pollution.	The Navy disagrees with this comment. In fact, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment. Furthermore, many of the Navy's environmental initiatives focus on ocean stewardship and seek opportunities to control our "ecological footprint" in relation to marine life, coastal impacts, and water quality. We have installed technology aboard our ships to keep plastics out of the ocean and safely manage our biodegradable waste stream. We are a world leader in marine mammal research, and are funding

ID	Organization	Public Comment (Website)	Navy Response
			approximately $26 million annually in marine mammal-related research projects from fiscal years 2007-2009. We serve as the executive agent for the Department of Defense Coral Reef Task Force. Major ocean stewardship efforts can be seen in our comprehensive approach to managing effects on marine life for all of our training ranges and operating areas. This environmental planning documentation is being coordinated with the National Marine Fisheries Service. In addition, the U.S. Navy has programs in place to manage threatened and endangered species on and around our installations; safely clean up past hazardous waste sites for future reuse; explore and develop new, greener technologies for equipment design and maintenance; and recycle metal, wood and glass. Navy installations and ship's crews frequently partner with local communities on volunteer shoreline and neighborhood cleanup projects.
Name Withheld – 24-1		i notice that your reference to go to a site shows misspelling so that the public cannot get to the site you reference. you had better repost this entire federal register notice so your spelling is correct. you have left an a off Alaska in your website reference. please correct immediately and extend time to comment since you placed the wrong site for comment. attention amy burt and a. m vasllandingham. it is interesting that nowhere on your site on in your register notice do you give any fax numbers, any e mail addresses. one has to wonder why you remain so anonymous and fail to help the public contact you. are you afraid of the comments you will get from American citizens who are tired of your killing the birds, animals and fish in the sea in massive amounts?	A correction to the Federal Register notice was published on 21 December 2009, to correct the error and a notice was put in red and bold font on the front of the Navy's GOA webpage. The Navy provided numerous avenues to contact the project manager and submit comments; via mail, fax, in person, and via the website.
Name Withheld – 25		What is lost by your actions may never be regained. Take a lesson from the doctor’s oath. FIRST do no harm. Please reconsider the magnitude of you actions. Thank you,	This comment is duly noted.
Name Withheld – 26		I attended the public meeting in Cordova earlier this month, and after listening to both the talks and the testimony, I have come to the conclusion that I do not want to see either Alternative's 2 or 3 employed but want the Navy to stay at the current testing level of 14 days with no live ammo. I do not believe that the affects on marine mammals will be as innocuous as described in the EIS.	Please see response to Ellen Americus – 1.

ID	Organization	Public Comment (Website)	Navy Response
Name Withheld – 26-1		I do not believe that posted look-outs for whales will be able to see all whales in the area that might be impacted. I think that there are times of year when there would be less chance of affecting whales, but the general period the Navy wants to use includes times of high whale migration.	The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate.
Name Withheld – 26-2		In addition we were told that in the May-September window over which the exercises might occur the actual dates will be determined not by any biological concerns that might differ during the time period, but by when navy ships happened to be conveniently located.	Navy exercises are joint training exercises with the Air Force and the Army, and are scheduled many months in advance, for planning purposes, and to determine which Navy assts can participate. The schedule of training within the April – October timeframe is based on other training and deployment schedules, and numerous other variables.
Name Withheld – 26-3		I also am not totally convinced that trace chemicals introduced into the water column will have no affect. I don't want to see any chances taken in an area that has never completely recovered from the Exxon Valdez oil spill. For the above reasons I am against the increased exercise levels.	Please see response to Brakel – 6. Additionally, please note that as depicted in Figure 1-1, Prince William Sound (PWS) is over 50 miles from the nearest corner of the TMAA where the proposed training activities will occur.
Name Withheld – 27		Please eliminate sonar use in the Gulf of Alaska. Thank you.	This comment is duly noted.
Name Withheld – 28		Go Navy!!!! Love the troops and practice protecting us all you want.	This comment is duly noted.
Name Withheld – 29		I am writing to express my opinion in regards to the proposed mid-frequency active sonar testing in the Gulf of Alaska, near Kodiak Island. I strongly urge the Navy to NOT change the training exercises to include sonar testing in this critical marine habitat area. With approximately 100 remaining Northern Right Whales near this proposed testing area, it would be an extreme risk on the part of the Navy to do any type of sonar testing there. It would be tragic to see the loss of any of these very rare marine mammals. Again, please do not include sonar testing in the Gulf of Alaska. I am not an environmentalist and do not belong to any organization. I am simply a concerned Alaskan resident. Thank you.	Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. This training is critical to the safety and security of our military personnel. Additionally, please note that a discussion of potential impacts to North Pacific right whales from sound sources proposed for use in the TMAA is presented in Section 3.8 of the EIS/OEIS. In addition, it should be pointed out that the Navy has conducted mid-frequency and high-frequency active sonar activities for decades with no indications of injuries to resident beaked whales at training ranges in Hawaii and Southern California or to right whales on the East Coast. There are no indications for broad-scale impacts that are either injurious or of significant biological impact to marine mammals and the Navy's analysis demonstrates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Finally, it should be noted that the Navy is in full compliance with the Marine Mammal Protection

ID	Organization	Public Comment (Website)	Navy Response
			Act and the Endangered Species Act. For more information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.
Name Withheld – 30		I am concerned over the impact on marine mammals in the Gulf as well as the impact on migratory populations. I am concerned over the far ranging impacts both for marine ecology and for the traditional ways of life in the area that involve subsistence harvest of marine mammals for food and cultural purposes.	This comment is duly noted. The Navy shares your concerns. As such, the Navy has conducted a thorough analysis of potential effects of it proposed activities in Chapter 3 of the EIS/OEIS using the most current and best available science, with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species.
Name Withheld – 30-1		I am also concerned about the air and water pollution caused by military exercises in the area.	The EIS/OEIS thoroughly analyzes the impacts of air and water quality. Please refer to Sections 3.1, Air Quality, and 3.3, Water Resources, of the EIS/OEIS. In addition, you may be interested in Section 3.2, Expended Materials, which describes the impacts of potentially hazardous materials such as explosives constituents.
Name Withheld – 31		I am VERY much against this happening!! Our marine mammals do NOT deserve this!! Our military defense is important, but so is our wildlife!! Let's do something that doesn't affect creatures! It's been a problem in California, so why would you implement it in Alaska?? Why would you continue to do something that you KNOW is bad for the environment or it's inhabitants??	This comment is duly noted. Please note that last year, the U.S. Supreme Court upheld the Navy's sonar activities off the coast of California. Please note that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The Navy's analysis indicates and this history indicates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS. Additionally, Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS. As part of the Integrated Comprehensive Monitoring Program, research to measure the ability of Navy observers to detect marine mammals is also underway.

ID	Organization	Public Comment (Website)	Navy Response
Name Withheld – 31-1		There has to be another way, I don't see why the world has to be this way, man is going to ruin himself being greedy...why can't we all just get along?? WAR sucks. Life is good, live it...and let the whales and other sea life live thier lives, how would YOU like to have your ears hemmorage?? Or be disoriented?? That is what they ADMIT it oes...what else aren't they telling us?? I VOTE NO! NO! NO! Scrap this TERRIBLE idea!!! Don't hurt God's creatures!!	This comment has been duly noted.
Name Withheld – 31-2		Thanks for letting the public comment, now please LISTEN!!	The decision on which alternative the Navy will pursue will be made in light of the Purpose and Need by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Name Withheld – 32		It is a negligent proposal to do sonar testing in cook inlet. there are far too many sensitive species of sea animal in this region. Valuable not just economically. Research shows a detrimental effect from this activity. Please reconsider!	Please note that the proposed action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. Additionally, Cook Inlet does not fall within the action area of the Proposed Action, as such, no Navy training activities would occur in the Cook Inlet. Please note that as per Chapters 1 and 2 of the EIS/OEIS, with the exception of Cape Cleare on Montague Island located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore, far from the Cook Inlet.
Name Withheld – 33		I vote for the option to not do any training in the Gulf of Alaska or anywhere near critical habitat. This is unnecessary and a waste of taxpayer dollars. It's long past time the military needs to be more accountable to the environment and good stewards of this planet we all share. Sonar is very detrimental to marine animals, not to mention the explosions you are planning.	The Navy shares your concern for marine life. As detailed in Section 3.8 for marine mammals, the Navy believes that the proposed training and use of sonar will not pose a significant risk to whales given that these same activities have been conducted for many years in other Range Complexes with no indications of any adverse impact to marine mammals, fish, or other wildlife. In addition, the Navy implements protective measures during its training events as developed with NMFS as a cooperating agency. In authorizations under the Marine Mammal Protection Act and Biological Opinions under the Endangered Species Act, NMFS has found these same training events will not pose a significant threat to marine life under their purview.

ID	Organization	Public Comment (Website)	Navy Response
Name Withheld – 33-1		How about simulated training - cheaper and less cost to the environment. We have the most powerful military in the world, you don't need to go around proving it all the time.	As explained in Section 2.3.2.4 of the EIS/OEIS, exclusively training with simulations would not support the Navy's Purpose and Need and was therefore eliminated from further consideration.
Name Withheld – 34		I have reviewed informational summaries concerning the draft EIS and I have some concerns. Although I believe that military training exercises are vital for the protection of our nation, at this stage I support the "no action" alternative. At this juncture I am concerned with the current plan for the Navy's planned sonar training activities.	This comment is duly noted.
Name Withheld – 34-1		I believe that these activities should be held in areas where there are much less dense populations of marine animals, and that they should be held in geographical areas in which the sonar can be better contained. I am also concerned with what I view as inadequate mitigation measures which appear to primarily consist on on-board visual monitors. Thank you for considering these comments.	As explained in Section 2.3.2.1 of the EIS/OEIS, a relocation of training activities would not support the Navy's purpose and need and was therefore eliminated from further consideration. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process. The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of conducting active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations, the Navy feels its protective measures are adequate. Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. Chapter 5 of the EIS/OEIS, Mitigation Measures, presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. While the Navy is very confident in its well-trained lookouts, it does not expect that all animals present in the vicinity of training events will be detected. The acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided.
Name Withheld – 35		To Whom It May Concern: I am writing to support the no action alternative in regards to the Navy's continuing use of	Regarding the 425,000 marine mammal takes, please see response to Wicks – 2 above.

ID	Organization	Public Comment (Website)	Navy Response
		the Gulf of Alaska for training activities. I am particularly concerned about the proposed use of extensive sonar training which is predicted to result in more than 425,000 marine mammal "takes" per year. This is an unacceptable and unreasonable burden to put on these marine mammals including at least 7 endangered species that depend on this habitat.	The Navy fully analyzed potential impacts to marine life in Section 3.8 (Marine Mammals) of the EIS/OEIS and is in full compliance with the Marine Mammal Protection Act, the Endangered Species Act, and NEPA. The analysis concludes that there is no significant impact to population levels of marine mammals. For more information about the Navy's compliance with these and other regulatory requirements, see Chapter 6 of the EIS/OEIS.
Name Withheld – 35-1		As the understanding of the effects of this underwater noise on marine mammals is not well understood it would be imprudent to allow this level of harassment to these populations of marine mammals. Please do not allow the expansion of training activities in the Gulf of Alaska including active sonar to take place. Thank you for your time and consideration in this matter.	This comment is duly noted. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Name Withheld – 36	The Cove Lodge, Incorporated	I am most concerned regarding the proposed sonar testing by the US Navy in the Gulf of Alaska. In addition to the concerns that have already been expressed regarding the lack of knowledge of the potential impact on marine mammals and fish populations I have concerns over that safety of mariners. If there is a substantial risk to marine mammals I can but believe that there is the potential for some unintended impact upon humans in the region. I don't feel that adequate precautions have been undertaken to assure that humans working on the Gulf of Alaska or living in the coastal communities will be unaffected. If I am on the water or below deck during a test I believe there is real potential for unintended human impact.	As described in Chapters 1 and 2 of the DEIS/OEIS, with the exception of Cape Cleare on Montague Island which is located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The majority of the TMAA is a much greater distance from shore and Navy training activities in the TMAA should have no direct affect on coastal communities. There are no activities proposed that will have a direct impact on humans at sea in the Gulf of Alaska, as indicated in Section 3.12. In addition, Chapter 5 of the EIS/OEIS provides a description of mitigation measures and safety procedures to prevent potentially dangerous interactions with other users of the Gulf of Alaska, including humans.
Name Withheld – 37		First, thank you for your service. From the logistics desk worker to the SEAL member to the person reading this, you are all appreciated. I strongly support our armed forces being adequately prepared to defend our country and our way life through practice. However, among the many things that make our country great are the amazing amount of wild lands and creatures within and along our borders. A hike through a National Park or seeing a whale breach on a day cruise have provided simple pleasures to millions of people in otherwise hectic times.	This comment is duly noted.
Name Withheld – 37-1		If we are going to unnecessarily use weapons and tools like SONAR in the course of practice that would kill the very creatures that contribute to the magnificence of our being,	As described in Chapter 3, there are no proposed activities that are likely to kill wildlife in the Gulf of Alaska. As detailed in Section 2.2.2, there is a need for integrated training including

ID	Organization	Public Comment (Website)	Navy Response
		then what way of life are we left fighting for? Please do all possible to come up with other alternatives to practicing with SONAR and other tools that harm wildlife. Certainly there are high-tech replacements available as have been developed for other branches that provide realism without the use of actual weaponry and ammo. Thank you	the use of sonar by Navy in Alaska waters. In addition as presented in Section 2.2.1.6, the use of alternative means of training and detection of submarines has been investigated and rejected as discussed. As described in Section 2.3.2.4 of the EIS/OEIS, alternatives such as simulation, have great value during different phases of training, but ultimately, the training value generated by the actual firing of live weapons cannot be recreated by other means currently available.
Jared Woody		I believe that the US Navy has taken the appropriate steps in planning this exercise, and have minimized their scope of impact to wildlife in the effected area. I agree with State of Alaska biologists that the exercise may be best done in the winter to avoid migratory animals, such as some whales, but I do not believe that a summer exercise would be overly detrimental, provided the safety parameters outlined by the Navy are followed. I fully support having the Navy conduct exercises in Alaska and I believe that these exercises are a vital aspect of maintaining an alert and ready national defense.	This comment is duly noted.
Stephen Wright - 1		To the U.S. Department of the Navy: I am appalled that the U.S. Navy is proposing to conduct mid-frequency active sonar exercises in the Gulf of Alaska. This type of sonar testing has been demonstrated by a multitude of scientific evidence to have extreme adverse impacts to marine mammal populations. The U.S. is not at war with foreign submarines in the North Pacific and these exercises are completely unjustified under present circumstances.	The Navy does acknowledge that the science of sound in the water and its effects on marine life continues to evolve and has conducted the analysis of sonar use in the EIS/OEIS using the best available science. As detailed in Section 3.8 for marine mammals, the proposed training and use of sonar should not pose a significant risk to whales given that these same activities have been conducted for many years in other Range Complexes with no indications of any adverse impact to marine mammals in those locations. In addition, the Navy implements protective measures during its training events as developed with NMFS as a cooperating agency. In authorizations under the Marine Mammal Protection Act and Biological Opinions under the Endangered Species Act, NMFS has found these same training events will not pose a significant threat to marine life under their purview. Please see Section 2.2.2 regarding the strategic need for anti-submarine warfare training by the U.S. Navy. Please see Appendix F regarding strandings associated with the use of sonar and the degree to which these impacts have been widespread.
Stephen Wright - 2		Of particular importance is that these proposed exercises are immediately adjacent to endangered Northern Right	As presented in Section 3.8 and depicted on Figure 3.8-1, the North Pacific right whale Critical Habitat is approximately 16

ID	Organization	Public Comment (Website)	Navy Response
		whale migration routes. Some scientists estimate literally millions of other marine mammals could be adversely impacted by these tests. I urge the U.S. navy to implement NO ACTION on this poorly considered proposal. Respectfully, Stephen E. Wright P.O. Box 20021 Juneau, Alaska 99801	nautical miles from the nearest corner of the TMAA and the generally postulated route for right whales "migrating" would be areas to the west in the Gulf of Alaska using passages between the Aleutian Islands in movements between the Bering Sea and the designated Critical Habitat areas. Please note there are no "tests" proposed as part of the Navy training activities. Also note that Section 3.8 provides the estimated numbers of "takes" (under the Marine Mammal Protection Act) for each species of marine mammal for each of the proposed alternatives, which is not necessarily equivalent to an "adverse impact".

I.7 ORAL COMMENTS

I.7.1 PUBLIC HEARING TRANSCRIPTS

I.7.1.1 KODIAK

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PUBLIC HEARING ON

GULF OF ALASKA NAVY TRAINING ACTIVITIES

DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

January 7, 2010

5:00 p.m. - 8:30 p.m.

Kodiak High School Cafeteria

722 Mill Bay Road

Kodiak, Alaska 99615

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P R O C E E D I N G

MR. MICHAELSON: Good evening and thank you for coming tonight. My name is Lewis Michaelson and I will be the moderator for tonight's hearing on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement, which you will hear tonight referred to as the draft EIS.

Hear to receive your comments are Commander Vic Weber, U.S. Third Fleet Joint and Air Training Officer, MR. Alex Stone, who's the Project Manager from the Navy's Pacific Fleet and Lieutenant Amy Cox, from the National Marine Fisheries Service.

Let's look at the agenda for tonight. Hopefully you all had the opportunity to talk to the many subject matter experts who were staffing the poster stations during the open house. The primary purpose for this portion of the hearing is for the panel members to listen to your comments firsthand. They will not be answering questions during this phase of the proceedings. Comments and questions will be addressed in the final EIS.

After I finish this introduction, Commander Weber will give a brief overview of the Navy's training activities in the Alaska Training Areas. Next, MR. Alex Stone will brief you on the environmental impact analysis process and summerize the results reported in the draft EIS.

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The last item on the agenda, however, is really the most important. The public comment session is your opportunity to provide information and make statements on the record. Your input insures that the decision makers can benefit from your knowledge of the local area and any environmental effects you think may result from the proposed action or alternatives.

Keep in mind the EIS process is intended to ensure that decision makers will be fully informed about the potential environmental impacts associated with the various alternatives before they decide on a course of action. Remember that comments on issues unrelated to this EIS are beyond the scope of this hearing.

To request an opportunity to make a verbal comment during tonight's hearing, please fill out a verbal comment card. They're available at the registration table and if you'd like speak and you haven't filled one out, just raise your hand and Allison will bring you one. I have three speaker comment cards so far. Every speaker, including public officials, and spokespersons for organizations will have three minutes each to provide your comments. If you don't feel comfortable standing up here tonight to make a statement, the majority of the public, we know. You have until January 25th, 2010, to submit a written statement for consideration in the final EIS, or you can wait until

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tonight's public comment session is over and you can provide your comments privately to the court reporter, who's seated to my right. He's here to make a verbatim transcript of all comments made during the public comment session. Keep in mind that written comments are given the same weight and consideration as oral comments offered here tonight.

Now it's my pleasure to introduce Commander Weber.

COMMANDER WEBER: Thank you Lewis. Welcome to the public hearings for the Gulf Alaska Navy Training Environmental Impact Statement. I'm Commander Vic Weber and I'm the Joint and Air Training Officer for the Commander, United States Third Fleet. I have served as the lead air planner for the previous two fleet exercises, Northern Edge the past couple years. So very knowledgeable on that subject.

I want to thank you all on behalf of the United States Navy for attending this evening. This is one of five public hearings that the Navy is holding in Alaska for the Navy Training Activities EIS.

As Lewis mentioned, we hope you've had a chance to visit all the poster stations and meet with the Navy project team members. At the conclusion of this presentation you'll have the opportunity to make those comments as we've discussed.

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Navy air and sea training activities occur in the Alaska originate from Navy ships located within the Temporary Maritime Activities Area. That's going to be that yellow area shown in the Gulf of Alaska.

The Navy also conducts air activities in established Air Force and Army inland training areas. Inland training that we've established military operating areas, those are those purple regions on the chart. And the four restricted areas or targeted live fire range are showing up on the chart in red.

The Temporary Maritime Activities Area and the inland training areas together make up the Alaska Training Areas. The Navy participates in training exercises in Alaska Training Areas that are crucial in helping the Navy meet its missions. These ranges have attributes which contribute greatly to the success of Navy training there.

The first attribute is location. The Temporary Maritime Activities Area is located within flight range of several Air Force and Army bases and their associated air and land training areas. The proximity of personnel, resources, and equipment within a few hundred miles of the Gulf of Alaska allows for joint training opportunities for Navy forces.

The second attribute is area of the training area space. The vast area of the Alaska Training Areas provides

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ample space to support necessary forces and allows for the conduct of the full range of training activities.

Oceanographic conditions is the third attribute. The sea state of the Gulf of Alaska creates a challenging environment for training in the search and detection of submarines in anti-submarine warfare. Furthermore, the Alaska Training Areas serve as the principal training venue for annual joint training exercises, which can involve forces from the U.S. Navy, Marine Corps, Air Force, Army, Coast Guard, and local, state, and non-governmental agencies.

Training activities are organized by primary mission areas. The Navy currently trains in these five primary mission areas in the Alaska Training Areas. The training activities consist of operating aircraft and ships, conducting training against ships and aircraft, and practicing aerial surveillance.

The Navy trains in Alaska Training Areas to prepare the Navy -- Navy personnel and other military forces for global conflicts and homeland defense and homeland security activities. To meet our mission, the Navy must conduct their training activities in a realistic, live training environment. Realistic training insures Navy personnel maintain the highest level of readiness and capability and is the single greatest asset the military has in preparing

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to protect the American service men and women that defend the nation.

There's no such thing as a routine training when it comes to practicing combat skills. Diverse training opportunities insure that Navy personnel are able to react swiftly and decisively in a wide range of potential situations. Insuring Navy forces are prepared for deployment requires training where military personnel can learn through practical hands on experience the skills necessary to effectively plan and conduct operations. Additionally, advancing technologies also require more complex and varied training scenarios.

Alaska Training Area's provide training opportunities essential for the success of the military mission. While fulfilling our mission to train sailors, protecting the environment is a priority for the Navy. The Navy is committed to protecting the physical and natural environment and has established a successful track record of environment stewardship while meeting our missions. To accomplish our environmental stewardship goals the Navy implements protective measures on land and at sea to reduce potential affects on the terrestrial marine environment, and to insure public safety and accessability.

I will now turn the presentation over to Alex Stone, United States Pacific Fleet and will tell you about the

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Navy's proposed action and give you an overview of the draft EIS and the environmental analysis process.

MR. STONE: Thank you Commander Weber. Again, my name is Alex Stone and I am the Project Manager for the Gulf of Alaska EIS. I'm here tonight to give you an overview of the findings contained in the draft EIS.

The draft EIS was prepared by the Navy to comply with the National Environmental Policy Act or NEPA and Executive Order 12114. The draft EIS represents compliance with these environmental statutes and is an important part of the Navy's overall commitment to environmental stewardship as it trains.

The Navy is the lead agency for this EIS. In addition to their role as a regulator, the National Marine Fisheries Services, is a cooperating agency pursuant to Federal Regulations. Present with us here tonight is Lieutenant Amy Cox of the National Marine Fisheries Service, Alaska Region Office. She's here with us tonight to record your comments and issues. As a regulator, the National Marine Fisheries Service helps to insure the EIS and the proposed action are in full compliance with appropriate environmental laws and regulations. As a cooperating agency they provide early review of the proposed action, alternative, and analysis methods.

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of Defense current and near term training requirements. In addition to training activities currently conducted, Alternative 1 proposes to increase levels of training activities for one annual Carrier Strike Group training exercise, to include first, increasing the duration of the exercise from current 14 to 21 days in the summer, and second, conducting anti-submarine warfare training exercises, which include the use of active SONAR.

Additionally, Alternative 1 proposes to implement training activities associated with force structure changes, including new ships, submarines, aircraft, new weapons systems, new training instrumentation, including a Portable Undersea Tracking Range.

Alternative 2 is also designed to meet current and near term training requirements. This alternative includes all elements of Alternative 1, and further increases the number of training activities, including conducting a second annual Carrier Strike Group training exercise of up to 21 days during the summer, and also a sinking exercise during each summer exercise, for a maximum of two.

Alternative 2 is the Navy's preferred alternative because it would fully support required Navy and joint training activities. It also allows the Navy the greatest flexibility to carry out its training mission in the Alaska Training Areas.

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In preparing the draft EIS, the Navy evaluated the potential effects of the alternatives on the marine, natural, and human environment. The Navy took a comprehensive approach in assessing the potential effects on 14 different resource areas. I will present some of these findings here.

We encourage you, if you have not already done so, to review the draft EIS, which presents the findings of the Navy's environmental analysis for each of these resource areas. We welcome your comments on the findings and the methods used in the analysis.

The Navy's use of active SONAR and explosives puts sound into the marine environment. While preparing the EIS, Navy scientists analyzed the potential effects of sound in the water on marine life, including marine mammals, sea turtles, fish, birds, and marine invertebrates. The method for determining potential sound exposures to a marine animal was jointly developed by the Navy and the National Marine Fisheries Service, and represents the best science currently available.

The results of the analysis indicate that there is the possibility for physiological effects on marine mammals. Behavioral effects are also predicted. However, these results do not consider the use of protective measures, which would reduce the likelihood of these predicted

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exposures. There would be no significant impacts on sea turtles given that SONAR frequencies used by the Navy fall outside the hearing range of sea turtles hearing range and the low occurrence of sea turtles in this training area.

Effects on marine invertebrates are predicted to be localized and minimal given the size of the training area and frequency of explosions. No significant impacts of fish and birds are anticipated from the use of active SONAR. The use of explosives in Navy activities may result in injury or mortality of individual fish or birds in the immediate area, however, these activities would not result in significant impacts to the overall fish population or bird population, or habitat.

The Navy does not expect any impacts on marine mammal populations, but we recognize that there may be potential effects on individual marine mammals. To minimize environmental impacts while training at sea, the Navy has developed and implements protective measures, including posting a minimum of three well trained lookouts at all times, and an additional two dedicated marine mammal lookouts during training activities with active SONAR. Establishing a safety zone during training exercises using mid-frequency active SONAR. Coordinating with the National Marine Fisheries Service and reporting marine mammals sighted during major exercises. And during certain

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exercises, surveying the area for marine mammals including conducting aerial sweeps by Navy aircraft.

Additionally, during the past five years, the Navy has funded more than $100 million dollars in marine mammal research. Through this research, the Navy is continually improving the ability to use SONAR in an environmentally sensitive manner.

The Navy also analyzed effects from other sources or stressors on physical and biological resources including, air quality, expended materials, water resources, marine plants and invertebrates, fish, sea turtles, marine mammals, and birds.

For most of the resources analyzed in the draft EIS, we found no significant impacts. There is a potential for effects on marine mammals from the proposed action as I've discussed.

The Navy is in consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife to ensure the effects on species protected by the Marine Mammal Protection Act and the Endangered Species Act are minimized.

The Navy analyzed the effects on the human environment, including cultural resources, traffic, socioeconomics, environmental justice and the protection of children, and public safety. The findings in the EIS show

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that no significant impacts on the human environment are likely from the implementation of the proposed action.

There would be no significant impacts on civilian access or tourism, and there would be no risk to public safety. In addition, the Navy is communicating with 12 Alaska native tribes in the area.

The Navy has completed the first three steps of the NEPA process and we are now in the phase providing for public review of the draft EIS. To review the progress so far, the EIS was initiated back in March 2008, and the Navy held public scoping meetings here in Kodiak, Anchorage, and in Cordova.

Government agencies, organizations, and the public were encouraged to submit comments at the scoping meetings or to provide written comments throughout the public comment period. The comments received were considered in the preparation of the draft EIS that we've discussed tonight.

We are now in the phase -- in the public hearing and document review step of the NEPA process. This phase is an essential part of the process because it allows the public to review the document and comment on the Navy's analysis of environmental effects. We encourage you to provide your input by January 25th so that it can be considered for incorporation during the development of the final EIS. All

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comments received will be considered.

The Navy is committed to keeping the community informed throughout the development of the EIS. These public hearings are just one of many opportunities to share information about the EIS and, more importantly, to encourage your feedback and comments.

Now I will turn it back over to Lewis to describe how to obtain more information and how to comment on the draft EIS.

MR. MICHAELSON: Thank you Alex. In addition to holding these public hearings, as I think many of you know, the Navy has established a website to make it easy for you to find and comment on the environmental documents. The draft EIS is posted on the website. Also there's additional background information and links to the fact sheets and posters that you saw here tonight.

You may also review the draft EIS and other publicly available documents by visiting one of the designated information repositories. The addresses of these repositories are provided in the fact sheet packet that you received when you came in. There are eight of them currently established in various cities in Alaska. Both the information repositories and the project website contain project documents, fact sheets, and background information for you to review.

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The Navy, as you've already heard from both of our panelists here, welcomes your input and review on the analysis contained in the draft EIS and there are several ways for you to submit comments.

In just a moment here we'll be accepting oral comments. You can also provide written comments in several different ways. With a comment form that you can turn in tonight if you'd like. You can give it to a staff member at the registration table, you can mail it in. That address is posted here right and on the fact sheets. You can also submit comments electronically via the project website.

All comments must be postmarked or received by January 25, again, 2010, to be considered in the final EIS.

We're now begin the oral comment period of the portion of the public hearing. If there is anyone again, who wishes to speak please fill out a card. I know we've collected a few more, again if you would like to please raise your hand. I want to make sure that anyone and everyone who wants to speak gets that opportunity to do that tonight. Please help me get through this in a way that we can capture all of your comments. Again, the court reporter -- it's very important that we get this on the record. So, I ask first that you please speak clearly and slowly into this microphone here. I'm going ask you to

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come up to the lectern. Each person will be allotted three minutes to speak. If you have prepared a written statement, you may turn that in at the registration table and/or you can read it out loud as long as you can do so within the three minute time limit. Finally, please honor any request that I make for you to stop speaking when you reach the three minute time limit. In order to make that easy for you to do that, I have a card that I will hold up when you have 30 seconds left. That will make it easy for you to wrap up your comments on time and should you go the whole three minutes I have this handy little red one that says, end. I think the meaning is probably pretty clear on that one too.

We are scheduled to be here until 8:30. I only have five cards here. It's quite common that as we go through those comments others of you will be inspired to speak. Nonetheless, my guess is we will not exhaust the time between now and 8:30. And in cases of that nature we're usually more than happy to take what I call, second helpings, which would be an opportunity to come up a second time for another three minutes. So, anyway I think that's going to work out quite well for us tonight.

So, we're ready to begin. Let me go head, because it is a little bit of a walk up here and so that you can be ready to come up, and know when your time is I'm going to

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read all of the names out to begin with so that you will know where you are coming up in the rotation. My first speaker is Carolyn Heitman, followed by David Kubiak, Katherine Ellanak, Theresa Peterson, and Amanda Barnette. So, if you would just do the favor of coming up, the first speaker Carolyn Heitman. And you don't have to provide your address or anything like that. If you just give us your name and if there's any organizational affiliation that you want reference. Yeah, if you -- why don't you actually pull the whole gooseneck down.

MS. HEITMAN: Oh, okay.

MR. MICHAELSON: So it doesn't fall out of the hole there. And there we go, that should work. All right. You all right?

MS. HEITMAN: Is that good enough?

MR. MICHAELSON: I think we can hear you. You're close enough.

CAROLYN HEITMAN

Commented as follows:

My name is Carolyn Heitman. Is that good?

MR. MICHAELSON: Yeah.

Okay. One of the things that was confusing to me and one of the gentlemen cleared up for me earlier was on -- let me find the page here. On page 2-4 of the draft it showed the whole Island of Kodiak in red, which was

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enclosed within the restricted area, and that was a little bit confusing to me. Because I do know a couple years ago the FAA did enforce restricted air space over parts of Kodiak Island which included our airport. And -- so anyway he cleared up and we looked in the book and he it -- on your map over there it's not on the map, but he said it was a misprint and then at final he was going to make sure that it was in black. So, if I understand Kodiak is not included in restricted area as Fort Richardson. Okay.

And, let's see here -- and one of the things I had requested in my comments is a boundary line in the training area covers the Aleutian Trench and I had requested that the Navy list what types of exercises would take place in the trench, what type of SONAR and the effects that it -- the impacts it would have to the sea life that lives within the trench, and I didn't see that addressed.

And it states here that the Gulf -- the Gulf of Alaska draft states that the Navy does not know what the environmental damage or harm would be to birds from mid-frequency at long range, and I'd like to see that addressed. No detailed information on how the Navy exercises will impact fisherman. Whether or not, you know they'll be restricted. I understand if you go by -- one of the choices was that there would be two 21 day training periods rather than just one, if that one was chosen. So,

I'd like to see more emphasis on how it would affect the livelihood of fisherman.

Also, it's -- okay, let me find it here. On section 3.14, on public safety you say there would be no public safety issues. In that section though under public safety it says, activities that could affect public safety include electromagnetic energy, but no details were given concerning that. And I would also like to know -- when you did the EIS for Hawaii uranium and red and white phosphorus was used in the training exercises. I would like to know if that will be used in the Gulf of Alaska.

And, let's see, and although you mentioned new proposed weapons systems, you didn't identify them. I'd also requested that the Navy fund our electromagnetic radar system here and -- through the University of Alaska and it's classified as an electromagnetic warfare systems radar that the Navy could use. So, I would like to see that addressed if it will be used.

MR. MICHAELSON: Okay. Our next speaker is David Kubiak.

MR. KUBIAK: Is this counting?

MS. TURNER: No. Of course not.

DAVID KUBIAK

Commented as follows:

Yeah, thank you ladies and gentlemen for the

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opportunity to address this EIS -- the draft EIS. And I appreciate you coming to Kodiak. I -- with 18 days left, I'm the Chairman of the Alaska Marine Conservation Council. So, I'm here sort of on duty, like you are.

With only 18 days left to comment, if the January 25th deadline is to be kept, I've got slow upload for my computer. I guess might be able to leave it on all night and download your EIS on the computer. But 25 megabytes at 56K takes a long time. And I think I have a obligation since I don't have the information really here to review, I think it would be a mis-step and be irresponsible for me to make a pointed comments about that impact statement. I did though here Carol say that -- and it reminded me that if we have 21 days -- two periods of 21 days, basically six weeks of training exercises, and they're up on the edge of the Gulf there, that's prime fishing bottom. And that's a huge chunk of time out of a commercial fisherman's opportunity especially -- I'm a halibut fisherman and that would be a huge chunk of time out of the halibut season. I don't myself go there, I've got a small boat. But I know the more nautical fellows are out there all the time and that's prime halibut bottom. So that's a huge -- a huge divot in their -- in their season, 21 days times two.

But other than that I just want to say, I appreciate you coming here and I'll look forward to reading the EIS

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completely. But that really -- that 18 days left to comment, wow, that's going to be very difficult. Thank you.

MR. MICHAELSON: Two things. Can you just state your name for me, I didn't hear it.

MR. KUBIAK: Yeah, I sorry. David Kubiak.

MR. MICHAELSON: And before you leave I'm pretty sure we can get you a CD.....

MR. KUBIAK: Okay.

MR. MICHAELSON: .....so you don't have to deal with the download.

MR. KUBIAK: Yeah, well either that or I have to wait for the mailing time for this thing to get to me.....

MR. MICHAELSON: I'm sure we've got a CD around here we can get you.

MR. KUBIAK: All right, thank you.

MR. MICHAELSON: All right. Thank you MR. Kubiak. The next speaker is Katherine Ellanak.

MS. ELLANAK: I'm sorry, I'm eating an orange.

MR. MICHAELSON: I haven't started yet.

KATHERINE ELLANAK

Commented as follows:

Good evening, my name is Katherine Ellanak. I'm with the Sun'aq Tribe Environmental and Natural Resource Director here in Kodiak.

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And although your EIS came in -- sent out dated December 2, we only received the EIS last week. And this January 25 deadline is not fair. There are other deadlines that we need to work with here in Kodiak. But out of respect for this time, and consideration for the fisherman, and the sea life whatever's happening there -- I saw -- I skimmed through that and there are a lot of fish in that area that you want to be training in.

And that is not only affecting Kodiak fisherman and subsistence and sports. It goes all the way through the coast of Alaska up to my people in the Bearing Sea areas. And the seals -- we don't know how nomadic our animals are from the sea, the (indiscernible) and the fish, and the whales, the seals, the birds -- they have no boundaries. Even if you make a boundary there they're going to be coming in and out of there. And the fish, the sea's abundance, it's crucial right now because fishing is very critical right now. It's starting to be hard to be a fisherman anymore because of the prices. And we know nationwide that Alaska fish is like gold for anywhere in the world.

The other thing is when you guys do that April to October, 21 days, that's crucial time also for anything, fishing and the rearing of the babies from the seas. And the amount of lead, cadmium, and everything else is going

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to be used and exposing to our seas is detrimental. And I just would like to see that you guys can extend this January 25 deadline into something more appropriate for us to really review the EIS document. And we had a meeting yesterday with our tribe and it's -- you know, like I said, we just received that EIS last week and today's Thursday. And then there's no time for me and my Environmental Committee to meet with the Tribal Council and have a good meeting about this. Quyana.

MR. MICHAELSON: Thank you very much. The next speaker is Theresa Peterson.

THERESA PETERSON

Commented as follows:

Good evening and thank you for coming to Kodiak and giving us the opportunity to talk about this proposed action off our island home here.

My name is Theresa Peterson. I'm a member of a long time fishing family and I work with Alaska Marine Conservation Council. The Alaska Marine Conservation Council is a community based organization dedicated to protect the integrity of Alaska's marine ecosystem. And AMCC is concerned about the potential increases in Navy training activities in the Gulf of Alaska. Particularly of concern are the effects of underwater noise on living marine resources, especially noise resulting from the use

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of SONAR in this productive and important marine environment.

We support the no action alternative, which would maintain current training activities and does not involve the use of SONAR. The alternatives listed in the analysis are inadequate to explore a range of options to consider anything else at this juncture.

Overall the proposed action would result in dramatic changes in the acoustic marine environment inside and adjacent to the operating area that could have significant impacts on the marine mammals inhabiting these waters. Critical habitat for the North Pacific right whale, the worlds most endangered whale is located directly adjacent to the training area.

The draft EIS is lacking a robust analysis regarding potential impacts to the halibut and the halibut fishery. It includes no discussion or maps showing the major halibut regulatory area that directly overlaps the training area. Nor does it discuss halibut habitat in the area. This information needs to be added.

The draft EIS does not include an adequate discussion of salmon migratory routes in the Gulf of Alaska, and therefore lacks a robust analysis of impacts to migrating salmon species in the region. There is not a thorough assessment of the overlap with fishing areas, and the

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conclusion that there will be no socioeconomic impacts from the proposed action, including fishing is impossible to predict without comprehensive answers to the above mentioned comments.

It is probable that the Navy under estimates the number of marine mammals and fish that will be harassed, injured, and killed because it simply does not have the density estimates needed in order to accurately make this determination. There is no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in the Gulf of Alaska.

And finally, I know firsthand there are not adequate measures to mitigate the harmful affects of SONAR. The proposed mitigation measures are basically safety zones. And from what I'm understanding, visual sighting of whales. And having fished in that area for over 25 years and having spent sometimes days looking for a buoy in the adverse weather conditions that we have out in the Gulf of Alaska, probably 80 or 90 percent of the time. I do not have confidence that visual sightings is an adequate mitigating measure.

And finally in closing, I would very much suggest that you extend the comment period an additional 45 days in order to allow people adequate time. And again, thank you for coming.

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MR. MICHAELSON: Amanda Barnette.

AMANDA BARNETTE

Commented as follows:

My name is Amanda Barnette. I'd also like to thank you for coming to Kodiak and listening to our comments. I think the Navy should establish minimum visibility requirements while training, especially while training with active SONAR, so that the lookouts may identify marine mammals in the immediate area. Thanks.

MR. MICHAELSON: Thank you very much. Is there anyone else who has been inspired at this point to add their comments to those that have already been offered? I want to make sure everyone has had at least a first chance. If not is there anyone who has already spoken who would like to take advantage of second helpings? Yes ma'am, please do. Just all you need to do is state your name one more time for me, okay?

KATHERINE ELLANAK

Commented as follows:

Katherine Ellanak with the Sun'aq Tribe of Kodiak. The other thing is we already have visual and historical history about what Exxon oil spill did. And it shows what the current is going to be like. And the red tide that happens and years of evolutionary natural disasters that there used to be abundance of fish here of all kinds. But

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after the '64 earthquake, right over there in Yuzhni where there used to be herring and everything else. The fish that used to be there are no longer there and the fish that we have presently here are in danger of other disasters that are going on. And you know, Bligh Reef is hit again and even the Arctic Slope with the BP having their pipeline problems, I mean even if it's far and beyond us, it's helping to come down here from the pipeline. And things of that kind of disaster, we need to consider those before the fish is going to be depleted.

It's -- I cannot name and I'm not a scientist to see when I was scanning through the EIS -- it's unfathomable to me to try to determine what all else is going to be affected by all the chemicals and toxins and hazardous materials that are going to be expended into the sea.

MR. MICHAELSON: Thank you. Anyone else? Yes.

Yes, can I have a.....

MR. MICHAELSON: Yes you bet.

I just want to.....

MR. MICHAELSON: You just come up, okay?

MS. HEITMAN: Okay.

MR. MICHAELSON: What's your name again please?

CAROLYN HEITMAN

Commented as follows:

I'm sorry, it's Carolyn Heitman.

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When the Navy did the Environmental Impact Statement for Hawaii, the west coast, Gulf of Mexico, and the entire east coast of the United States they got a permit from NOAA to -- and this is something that I had mentioned in my comments in a -- the last time. They got a permit from NOAA to incidently take two million marine mammals per year for the next five years. And I would like to have you include in the final if that permit will extend to the Gulf of Alaska. And if not will you be requesting a new permit for incidental takes and for how many marine mammals?

MR. MICHAELSON: Thank you. Anyone else who wants a second chance?

I have another comment.

MR. MICHAELSON: Okay.

THERESA PETERSON

Commented as follows:

Thank you. Theresa Peterson again. I have two brief comments. In reflecting on what Katherine was saying, I feel strongly that we have a lot of unknowns that are approaching our waters in the Gulf of Alaska and this northern climate -- and worldwide, in particular the ocean acidification and the changing ocean environment. But also in reflecting about commercial fishing off of that edge which has been -- like I said, I've spend decades out there doing that. And I've noticed a change in the whales habits

when you're long lining halibut and primarily black cod. The sperm whales and the killer whales -- we're kind of like dinner bells out there. They recognize a boat out on the edge, they hear you. You turn on the hydraulics, they come charging up to the boat. The whales in the Gulf just -- primarily over these last 10 years are getting habituated to associating the sound of a fishing vessel to a feeding opportunity. And so in thinking about this, when there's Navy operations going on and the other boats have been requested to leave the area, I would think there's going to be a natural tendency for the boat -- the whales to actually approach a vessel and explore to see what they're doing. Because they have been doing that. And I just wanted to share that thought. Thank you.

MR. MICHAELSON: Thank you. We've had someone turn in a card for his first opportunity. I believe it's Richard Courtney. Yes sir.

RICHARD COURTNEY

Commented as follows:

My name is Richard Courtney and I'm here representing myself. I'm also representing myself as a 20 year Navy veteran. I served on two aircraft carriers, a helicopter carrier, and a -- one of those large ones that you see right over there. I've ridden smaller destroyers and LST's.

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I find it absolutely critical for the U.S. Navy to practice in an area such as the Gulf of Alaska. I am an expert on meteorology and oceanography. I'm also an expert on the American sailor running around on a ship. And if you haven't figured it out, I'm still a little nervous here.

One of the things we don't recognize very much is what it is to be out there on a ship doing the good deed, that's defending your nation. You cannot go down to Hawaii in the middle of the summertime, run through a five to an eight foot sea state with a 20 knot trade wind and say, hey I know what it's going to be like to be up here in the Gulf of Alaska. It's a different environment. You walk out through your front door, you put a coat on, you put a hat on. You don't run out there bare chested in Kodiak in January. So it's absolutely necessary for us to understand that we have to work in other environments. That's what this is all about.

Now back when I was in they didn't have these, or they were greatly reduced. And this is a great thing, it's an honest effort to try and make sure we don't screw something up. But bare in mind that the United States Navy has been around 200 -- more than 200 years actually. We still have fish out there, we still have whales. I have not in the time I road on aircraft carriers, looking for submarines --

yes, I did that. I didn't see any dead whales wash up behind my ship. I never saw the Navy go out of it's way to try and hurt anything in the ocean. They are very, very studious about watching out for things. I was directly involved in that.

I'm not here because I think I owe the Navy something. I'm hear about my own personal interest. I'm not here for every man and woman that is out there on a ship right now that does not know what it's like to get beat up out there. All of you that claim that you've got fishing boats out there, would you take a nice 23 foot skiff and go running through the Bering Sea this time of the year, to go from St. Paul to Dutch Harbor? No, you wouldn't . You'd pick the biggest boat that you can, they one that rides the best and most comfortable. And that's what we're doing with ships. We're training people how to survive an environment. And there's only one way to do that, there's only on way to survive combat. Train like you fight and fight like you train. That comes right out of the Navy. Thank you for putting up with me.

MR. MICHAELSON: Thank you very much. Anyone else? With that, like I said we are here until 8:30. We're going to take a recess. If anyone else comes along and would like to make a comment we will do that. If you'd like to make a comment just one on one with Clyde over here you can

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do that as well. And we're going to ask subject matter experts to go back to the poster stations in case people have thought of any new questions that they wanted to ask. Thank you very much.

(Recess)

GENENEIEA PEARSON

Commented as follows:

My name is Geneneiea Pearson. I've lived in Kodiak since 1941 and have observed the whales since that time. But what I'd like to say is, that I'm disappointed in this meeting in that you did not have an open meeting so that we could hear your answers to questions. I think that would have been helpful and we could hear what -- other peoples concerns are more than just these comments. Because a lot of people are shy about talking, like me.

The other suggestion I would like to make is that you have a civilian observer, maybe on or two on each of these carriers to observe for the public as to what goes on. So that there's an honest assessment of what happens. If you can come up with something out there, I know it's hard because of the ocean, you can't really tell what's going on. But I'm very concerned for the fisherman that are being replace -- displaced during the period that the exercises will be taking place. And I'm very concerned for the marine mammals that will be out there and will be

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attracted to the boats. Because I know the whales now a days come up to the boats. I have fished myself for many, many years. I know that they're trusting us now, which they didn't used to during the years ago. When they were slaughtering them out here, when the Russians were right off shore out here, slaughtering whales. We could see the fleet at night, I looked like a city out there. But I know that at -- after that slaughter was over the whales were very skiddiest. If they saw us they were gone. We only saw then once. Where as now they aren't afraid of boats and they come right up to the boats sometimes. So I'm very concerned about this whole process and I wish the Navy figure out another way of working their ideas out for anti-submarine warfare. I wish they would go somewhere else to do it. Thank you.

RICHARD COURTNEY

Commented as follows:

Hi, this is Richard Courtney. I live in Kodiak, Alaska. I'd also like to add on to my statement that I made earlier. And one of the biggest reasons I feel it's critical to come up here and learn, as a sailor is exposure to the harsh weather conditions that are up here. At one point in my Navy career, I was up off the coast of Norway and I had 70 knots of wind and 35 foot seas. There was millions of dollars of damage done to five amphibious

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warfare ships and a destroyer. We had no exposure up there and very few people ever got a chance to work up there. And by learning to come up here and work in these harsher conditions, you have a better understanding of what it takes to survive. Especially in a combat situation. You don't have to look back any farther than World War II, and look at some of the actions of what ships had gone through and how much better they would have been prepared if they actually practiced in foul weather instead of practicing in the calm waters off of Hawaii.

So that's why I think it's critical to come up here. I don't expect a complete understanding of everything, but I think it's real critical for the military to come to work as a team up in rough weather. And that's about -- basically all I've got to say.

MR. MICHAELSON: It is now 8:30, my name is Lewis Michaelson, hearing moderator and we have no one left in the room and we have gone back on recess [sic] to officially close out and adjourn this meeting. Thank you.

(Hearing adjourned)

TRANSCRIBER'S CERTIFICATE

I, CLYDE PASTERSKI, hereby certify that the foregoing pages numbered 4 through 37 are a true, accurate, and complete transcript of Hearings held in Kodiak, Alaska on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement transcribed by me from a copy of the electronic sound recording to the best of my knowledge and ability.

_____

Date Clyde Pasterski, Transcriber

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PUBLIC HEARING ON

GULF OF ALASKA NAVY TRAINING ACTIVITIES

DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

January 8, 2010

5:00 p.m. - 8:30 p.m.

Fairview Recreation Center

Main Gymnasium

1121 East 10th Avenue

Anchorage, Alaska 99501

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out the comment sheet that you should have received when you came in here tonight. You can turn it in tonight or mail it to the address provided on the form. You an also log onto the project website that we provided and you can provide your comments electronically if you would like.

Keep in mind that all comments should be postmarked or received by January 25, 2010, in order to insure that they're considered in the final EIS.

So it's now time for the oral comment portion. Again, if there's anyone who wishes to, please just fill out a card, hold up your hand and Allison will come over and do that. I have four simple rules for the comment portion. First, please speak clearly and slowly into this microphone at the lectern over there. That's one of the ways we make sure we get your comments verbatim, recorded, and become part of the transcript and part of the official record of comments made on the EIS. Just give us your name and your organization you represent, you don't need addresses. Second, each person will have three minutes to speak. Third, if you prepared a written statement you can turn it in at the registration table or you can read it out loud if you can fit it into the three minute time limit. Fourth, please honor any request that I make to stop speaking when you've reached you three minute time limit. In order to make that easy for you to do, I have two signs with me

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tonight. One of them lets you know when there are 30 seconds left, that allows you to comfortably wrap up your comments. This is the one that I hold up when you've reached three minutes.

We've used this same format and will use it at all the meetings, however give that we be here until 8:30 for this portion of it and I only have two comment cards at this point. What we do usually and what we did at Kodiak last night, is I'll take everyone's first time for three minutes and then if you want to have a second helping, you can come up again and speak again. But I want to make sure we get through everybody first -- who had a first opportunity. So, with that the names that I have, Tom Lokash had asked to go first.....

MR. LAKOSH: Let him go second, because I'd like to take my additional three at that time.

MR. MICHAELSON: You know, I was going to suggest that actually. I'm totally with you on that, good deal, good deal. So, actually Wade Willis if you would go first. All we need to get is your name and any organization. Thank you very much.

PAUL D. KENDALL

Commented as follows (prior to start of hearing):

My name is Paul, middle initial D, Kendall. I'm an Anchorage, Alaska citizen. And I just came in for the

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first time to see what you had. It's my first time to be at one of these and I found it to be efficient, professional, entertaining, and amenable. And all you people have been very congenial and professional.

Because you're in what they call the Gulf of Alaska up around Cordova, Kodiak and the entry to Cook Inlet, I'd really like to see you bring some type of studies on the tidal. I think it's a high tidal area and there are only so many tidal areas around the world. And I'm of particular interest between Cordova and the Cook Inlet. And when I look at the resources that you're going to bring into the inlet like that, the ships and all of those monitoring devices. I'd like to have you make your data available to the local communities in the event that they move to some type of tidal generation for energy for our residential sectors.

And when you consider the fact that a pound of water weights about 62 [sic] pounds, and you put that into a ten foot by ten foot by ten foot cube, which is equal to something along the lines of a UPS delivery van. That content of that van equals about 31 tons or 62,000 pounds. And if you were to bring that poundage on board a ship, in essence you could use that weight on just one van, which is a ten by ten by ten cube of water. You could use that as a counter weight to move down to push gears. And then if you

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release that water you can actually have crawler or water wheel turn to make electricity as you move the water out. And as you move that water out back into the ocean through a pipe, what will happen is you can displace the air that's in the pipe, and that air will push turbines. And if you close off the back of that pipe as you release the water from the front end of it, you can also as the water runs out it draws the air the other way into a vacuum and those air reversals will turn turbines. So, you in essence have a ship that can generate energy onboard, especially with the tides. And when you begin to look at those ten foot cubic capacities of movement in tide, the numbers are huge and astronomical. So, if you're going to come into an area like that, around Cordova and Kodiak and the Cook Inlet, I would think that there would be some type of a participation. And I think they're getting ready to start the meeting, so I think I'm going to -- no.

So, what I'm saying, when I look at the resources and the competency of your people who come into this area, I think you could bring to the people maybe a ship. And you could bring that in -- into the communities of Kodiak and Cordova and Seward, and maybe bring us a couple of extra ships and we could use those ships as power plants and the community could learn about waves and tidal capacity for generating electricity, which is clearly our next future.

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Other than that I think that's about it. Except well there's one more thing. I do think you should have a video webcam here. And that this gentleman which is -- gosh, I have to get my glasses -- the gentleman who's taking this testimony, Clyde E. Pasterski, I think you should furnish him with the money to have a webcam. And the way that should be done is that an individual should be escorted over here and asked if they'd like to make a video or a video and audio, or if they'd like to have a video from a distance and let them sit down and perhaps make their own little video. Because the writing is just too onerous. And I think that the children would like to do that. You get more involvement from the public and it's much more easy. And even if the communication were to go on at length, I think it could still be monitored and curtailed at appropriate times such as we have coming up now. Because I think they're getting ready to have a presentation. Thank you very much for what you're doing. And I love my America and I want it back the way old American values. Thank you.

WADE WILLIS

Commented as follows:

Thank you very much and I appreciate -- first I want to say I appreciate very much the Navy coming up to Alaska and allowing us to speak. We're a State that is very

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supportive of the military and we are very appreciative of your coming up here to talk.

My name is Wade Willis, I'm a biologist for the State. Been up here for 20 years. I have worked extensively in Prince William Sound and worked as a biologist in the Gulf of Alaska, so I know the country pretty well.

Some of the concerns I have are that the operation area is being conducted in shallow areas and shallow shelf areas. And certainly those are areas that are very critical habitat for our resources -- our fisheries resources in Alaska. And I've very -- also very concerned that the operation area is in the middle of critical for migrating whales. I don't really know if it's an appropriate operation area for the military to be conducting more -- it's more aggressive SONAR operations. I would hope there would be areas of the country where we could identify for SONAR work that would not put such a risk to a lot of unknowns with our migrating whales. Several are endangered that move through this area. And using visual sightings of whales is notoriously quite you know, inaccurate. And a lot of the whales like blue whales can be underwater for very long extended periods of time.

So, I'm very, very concerned that the military is proposing 42 days in the summer. And as a guide I can tell you there's 90 days in the summer up there. And that's

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you know, about half of the summer you're proposing of possibility being out there conducting SONAR operations. That's a real concern of mine. I would hope that possible high use times for migrating whales could be avoided. And that possibility SONAR operations could be minimized as much as possible for the Alaska operation area due to the potential risk.

I'm also very concerned with the amount of toxins, the hazardous waste that's being proposed -- 10,300 pounds. I, particularly am very concerned with persistent organic pollutants which are really going through the roof in Alaska due to multiple sources. Our fisheries, our halibut, and long lived fishes like rockfish and lingcod are being limited in our ability to eat now because of persistent organic pollutants. And our marine mammals are showing extremely high levels of persistent organic pollutants.

So, I wasn't able to figure out how much of the 10,300 pounds would be POP's, but I would encourage the Navy to try to mitigate any POP discharge. Thank you.

MR. MICHAELSON: Thank you very much. Mr. Tom Lakosh. And he's requested that he take his second helping back to back. But since I have no other cards, I'm fine with that request.

TOM LAKOSH

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Commented as follows:

My name is Tom Lakosh, I'm an Anchorage -- Anchorage resident. But I've long been user of Prince William Sound resources and we appreciate your service, but find that some of the responses to my earlier inquires quite distressing.

First of all with respect to mitigation methods, I fell it's wholly inappropriate to use the standard of impairment -- hearing impairment of whales as the necessary triggering standard for abating operations. Clearly the standard should be, and adverse behavioral impacts upon marine mammals and should be the standard to cease operations and for avoidance of those oper -- of those species.

And when I inquired as to why we wouldn't schedule the training sessions for periods outside the migration of whales, towards winter obviously. And outside of the migration paths, I was told that, oh well stuff breaks in Alaska winters. Well, we know that. We're out there, I've been a fisherman in the wintertime. You know, freezing spray, et cetera, et cetera.

And if you guys don't want to build equipment to protect your 49th state, you might as well just take your stuff elsewhere. You know, bring up stuff that will work, do it in the wintertime outside of the migration seasons,

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and outside of their migration path. Establish a standard of avoidance of populations based on impacting behavioral standard of practices of the marine mammals. Set up a preliminary observations both with passive SONAR that is sensitive to the vocalizations of the whales, to find out where they are. Conduct your operations away from them to the greatest extent possible.

We realize you need areas to train -- designated areas to train to keep out other commercial activities and vessels and so forth. But that area should be large enough so that you can avoid populations, take adequate time to you know, preliminary you know, pre-scanning of the areas where you plan to train and make concerted effort to avoid population densities to the greatest extend practicable.

One other method that is -- that Alaskan's have learned is that you can also call some of these species you know, particularly pilot whales and orcas to your presence by just fishing for black cod and halibut. So, you can call those species out of your test area by hiring a licensed commercial fisheries, ones that have had particular problems in the past, given that the marine -- the whales recognize their hydraulic sounds. And bring the whales out of harms way. Pay the fisherman to feed the whales while you happily ping away out in the Gulf. There are a number of methods here that you haven't fairly

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considered, you haven't done your job. You could do a better job, you could bring better equipment to operate outside of our peak summer migration and commercial fishing seasons. And you know, and a much less impact on our resources. You're here to protect us, not only our hides but our resources. When you talk about Alaskan's, our resources are apart of us. We live in subsistence, we live in tourism, we live in commercial fishing. That's our livelihoods, and that's why a lot of us come here to Alaska is to experience the wild, an undisturbed wild. And we don't need you know, disturbances that we clearly know are going to harm our interests. We want you to protect us as whole people, not just part of us. And we want you to bring the proper equipment, make the proper preparations, and accordingly appreciate the resources and particularly marine mammals the way we do. Thank you for this opportunity.

MR. MICHAELSON: Is there anyone else who would like to speak tonight?

UNIDENTIFIED VOICE: (Indiscernible).

MR. MICHAELSON: Yeah. I just want to make sure I've got everybody who had a first -- anybody else who hasn't had a first shot yet and wants to come up here? Yes sir, go head.

PAUL D. KENDALL

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Commented as follows:

My name is Paul, middle initial D, Kendall and I'm an energy activist. And as far as credentials go, I'm neither accomplished, degreed, or published. And I came here primarily out of curiosity and because of my -- I love the Navy, and I love the military, and our services and I think they're one of the few groups in our society that is being taught to represent us all as one society, America.

But I'd like to make some suggestions to you. These will most likely be outside the scope of your EIS, but I'm really not sure what the scope is. In my world anything that contributes to a better society is a good thing and should be considered. So, I came here because I'd like to have you consider having some type of assigned energy -- an energy science technology officer, team, or department that travels with these fleets or groups of vessels. And I'd really like to see an actual vessel itself as designated as an energy science technology with each group of ships or vessels. And I'd like to see you gathering a tremendous amount of data in realtime, ice, tidal, temperature, wave, content, body contents, currents, et cetera.

I just made a brief list of the things that you could do to contribute to our society. I think that you come to. I'd also like to see you, because you're in such a high tidal impact area, and there's so few tides I think around

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the world. I'd like to see you check your mothball fleet to see if you couldn't bring some type of a vessel to Homer, Kodiak, Seward, and Cordova. Something that has been mothballed that the community might be able to use.

I'd like to see you come up in the winter so that we can get some ice data. And I'd like to see you -- let's see, consolidate your -- I forgot what that was about. My premise this, I'm convinced that we're going to be moving very, very quickly into water partnerships. And that there is no such thing as water ladies and gentleman. It's all hydrogen compounds, or contaminates, or particulates, or partnerships. And if I'm not wrong about this, we're about to see a whole new era of energy. And that energy is going to revolve around magnetic fields and the hydrogen atoms. And when I see these bodies, these vessels of tremendous capacity, intellectual and data rich with being able -- technology, with gathering -- data gathering rich devices, it would seem to me that it would be more interactive in those bodies of water for multiple reasons.

I don't see how we could disconnect energy from anything. I have come to conclusion later in my life that most of the things you see are manifestations of energy. And our children within the next decade are about to learn that connectivity and with that comes responsibility for our balance and our in harmony. And that cast is huge, and

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the Navy has, I think has a fundamental fiduciary obligation to those creatures in that ocean and those communities along the way. And in closing, I'm coming to an end here, I'm opposed to the War in Iraq and I'd like to see all of my troop and all of my people come back to America and begin to rebuild our values that we all share in common and quality of lifestyles and family lives. Thank you.

MR. MICHAELSON: Thank you. Anyone else who has been inspired to speak? And Allison will catch you on the way out to fill out a card, okay? If not then you can come up for a second time. Thank you.

WADE WILLIS

Commented as follows:

Thank you again, my name is Wade Willis. And I want to impress upon the Navy the opportunity they have to help the scientific community acquire baseline data. It is a critical, critical component to our long term stability as a nation and as a State that we understand, as best as possible the current populations of animals that we have, the migration routes, things like that. This is an incredibly good opportunity for the Navy to address that and to support the scientific community in ways maybe beyond the EIS evaluation. But to say you know, if we're going to have MOA we're also going to support some science

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research beyond this EIS listing, you know. Just to say that that's an important national strategic point as well. That you know, in exchange for our maybe degradating the environment a bit, we're going to help the State and the scientific community know more for the long term benefit, overall benefit may be far greater from the science we learn than the small amount of environment degradation that occurs due to our operations out there for 16 to 41 days a year.

So I really hope the Navy will look really hard in helping the scientific community which is dramatically under funded, to acquire some of that baseline data. Especially in the areas that you're getting ready to operate. You know, the Gulf of Alaska is some of the most difficult areas for the scientific community to get funding for. So that's mainly what I wanted to say on my second round. Thank a lot you guys.

MR. MICHAELSON: Anyone else ready for a second -- okay.

MR. KENDAL: I think these moments of gathering are very, very special. It's my -- pardon?

MR. MICHAELSON: Sorry, I missed your name.

PAUL D. KENDALL

Commented as follows:

Oh, my name is Paul, middle initial D, Kendall.

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I think these moments are very, very special that we gather. And the reason that they are is it allows us a collective view of diverse opinions and unknown moments of not really going where everyone's at and allows us to reflect on our own values and ideas. And I wanted to thank you for your ability to come around again. In today's world we're seeing a tremendous repression of the ability to collectively communicate in some unhurried fashion. Some contemplated mode, the more complex our problems become in coming back to some greater understanding of balance is going to require a slower thought process due to the complexity to find a resolution.

In having you allow a person to get up and have a fair share of time and then to come back around and circle, I think that's admirable and appreciative thing that deserves recognition. And I just can't stress enough that you should have these moments on camera, on video to share with the rest of the world. So that you can set the bar and show other people. It's very important, I think that all of our data be videoed on the internet. Something that's very magnificent that's happening there.

And the reason I actually came up here was to -- I hope that you'll chose Kodiak, and Homer, and Seward, and Cordova, and those places to come in with a couple of ships. There is something magnificent and inspirational

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about those ships and the men and women that represent some of our more fundamental values that created this great country, that I think are immeasurable in the long term. And naturally you won't forget the energy science technology designated vessel to share with the community.

And if I might -- one more thing real quick. To give you and idea of why I'm here to give you -- there are things moving very, very quickly sweeping across the, I think the entire plant, but especially America. There are over 40 manufactures of electric vehicles that are reaching in the next three years. In addition to that the Chinese have announced they are going all electric bicycles. And when you look at things like that, within three years every seven year old child in India, China, and Asia is going to know more about the lithium ion battery and electron (indiscernible) they ever learned. And when you put that into the internet on such a worldwide scale the bookends of those impacts, then pour tens of the times we have never seen before, like an industrial revolution. This new sense of awareness that is now coming through energy, responsible energy management. It not only brings us a new individual freedom and will which we've never seen before. Because it's heading home and transportation. But they pour tons of new degrees of awareness. So, when I see these fleets that represent large amounts of energy in partnershipping

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and transitioning with the water bodies, the great water bodies. Which are really hydrogen. I think these are moments that I hope that you'll discuss amongst yourself -- maybe more than you are. And thank you again.

MR. MICHAELSON: Anyone else who hasn't had a chance to speak tonight? If not, as I said we're going to go into recess now. We will still be here until 8:30. If anyone else comes forward in that time we will be happy to take their comments, or if someone wants to say something but doesn't like to doing it in front of a crowd people, again Clyde is available to take your comments orally, one on one. Keep in mind again that you do have the January 25th deadline for any written comments. So we're going to go into recess now. Thank you.

(Recess)

PAUL D. KENDALL

Commented as follows:

Well, my name is Paul, middle initial D, Kendall. This is like my fourth time I think here on giving testimony. It's my first time to be at one of these. And I just wanted to note for the record that your people have been very accommodating and professional and amiable. And they've made me feel very comfortable. And sometime those little moments in our everyday events go unnoticed and I just wanted to give notice to that.

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And also your presentation allowing the individuals to come back up after a second comment, I think that really needs to be recognized. These meetings where we gather as a community, as a collective group are very important. They need to be unhurried and plenty of time. But more importantly sometimes when you take testimony from such a diverse gathering, you will actually learn things onsite in multiple orders or reviewing your thoughts. And it's important, I think to allow that person to have a second opportunity to come back up and reflect on a prior position of change or some new insight. And I thought that was really wonderful of being able to have that little nuance.

Other than that you might have a little time clock up there with a large six or ten inch LED that -- where a person can see their time, and that way a person can have the dignity to shut themselves down when they're talking, which gives them more -- it empowers the individual to have more capacity to develop their personality and knowing the responsibility of time limit -- time limitations on talking. Anyway, thank you very much. That's it.

MR. MICHAELSON: This is Lewis Michaelson. It is now 8:30, we have not had anyone else present themselves asking to speak orally on the record here in front of the panel. So we are officially concluding, adjourning this meeting at 8:30 on January 8th. Thank you.

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(Hearing adjourned)

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TRANSCRIBER'S CERTIFICATE

I, CLYDE PASTERSKI, hereby certify that the foregoing pages numbered 4 through 36 are a true, accurate, and complete transcript of Hearings held in Anchorage, Alaska on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement transcribed by me from a copy of the electronic sound recording to the best of my knowledge and ability.

_____

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PUBLIC HEARING ON

GULF OF ALASKA NAVY TRAINING ACTIVITIES

DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

January 9, 2010

5:00 p.m. - 8:30 p.m.

West Homer Elementary School Gymnasium

3719 Soundview Avenue

Homer, Alaska 99603

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previous two we've held in Kodiak an in Anchorage, we've also got them coming up in Cordova and Juneau. Is that after everyone has had their first chance, if you have something else you couldn't fit into the three minutes, I'm going to ask you to come up for second helpings if you want those. But I do want to get through everybody first. Okay, and their first three minutes, that everyone's had that opportunity. So that's how we'll handle it tonight.

So, I believe Allison is about to bring me up a few more. Also, so that you can be ready when it's your turn, I'll try to occasionally read ahead what the names are that are coming up. So that you can be aware of that and be ready to come up to the microphone.

UNIDENTIFIED VOICE: (Indiscernible).

MR. MICHAELSON: Yes, that is correct, thank you. All right. So, the order that I have here is Paul Seaton, followed by Roberta Highland, Robert Archibald, Olga von Ziegesar, and Sue Christiansen will be the first five. So -- please Mr. Seaton -- and I don't need an address or anything like that. If you'd simply state your name and any organization that you representing, I'd appreciate it. Thanks very much.

PAUL SEATON

Commented as follows:

Well thank you. I am Paul Seaton, I'm the State

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Representative for District 35, covering Homer, Seward, and the outer Kenai Peninsula.

I received comments of concern from continuants at the initiation of the last training exercise. These concerns were mainly centered on the potential effects of new -- frequency SONAR on whales.

I thank the Navy for scheduling this meeting here in Homer for the convenience of our local residents and I really appreciate it. Alaskan's are concerned about the effects of copper in fresh water and marine environments, especially on fish. This includes reduction of copper used in bottom paints in our fishing fleets, and also we're currently undergoing a review this month of -- by the Alaska Department of Environmental Conversation on the aquatic life standards for copper. As those have been seen -- the current standards have been seen not be adequate to protect juvenile salmon for their homing and responses to avoiding predation.

So, I'm concerned that on table 3.2-22 on page 3.2-32, that the sonobuoys that are going to be used will increase the amount of copper discharge from the current level of 38.1 pounds to 2520 pounds under -- that's Alternative 2 versus the No Action Alternative. And the increase of copper from eight pounds to 540 pounds. And that first was copper thiocyanate, and so I would like to request that the

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Navy look at analyzing the use of a explosive charge to destroy those sonobuoys that does not incorporate those amounts of copper that would discharge into the Gulf of Alaska.

And so I appreciate that, I appreciate the fact that you are looking at the affect of mid-range SONAR on the whales, as that is a prime concern by my constituents. I don't have -- although I have a degree in biology, whale interaction was not that -- my expertise. So, I would appreciate you continuing to look at that. And thank you again for having this meeting here in Homer.

MR. MICHAELSON: Thank you very much. The next speaker is Roberta Highland.

ROBERTA HIGHLAND

Commented as follows:

Hi, I'm Roberta Highland. And I just found out about this meeting by reading the Homer News on Thursday. And I've always got issues when such a large amount of effort is put into having public meetings, that the people that are putting it together -- probably one idea is to contact any City Clerk office in the area that you're holding and they can give you the times, because really what would have been helpful was to have had this in the Homer News the week before because it's Saturday. And I just saw it on Thursday. It's just one way because of the cost and the

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work that goes into it. So, that would be my suggestion.

I always like to ask people to pretend that you're a whale, or a bird, or a fish, or other mammals when any of these decisions are being made. And just take it from that perspective so we're not doing it from our frequent human ideal and so anyhow that's just one of my ideas. Is really take that -- it sounds silly, but kind of take it seriously. And there are the decisions maybe change because of that.

And active SONAR sounds a little problematic, for sure. Underwater explosives sound problematic, and birds and fish dying sound problematic. I understand that you are doing a really good job on making sure that the least amount of environmental damage is done. But it's one of those consequences that happens no matter what.

I'm also wanting the carbon footprint and pollution considered. And I don't know if that's being given the amount of consideration that it needs to be. Because every time a ship goes, an airplane takes off, any of the things that will occur, there is a carbon footprint and there is pollution that happens with that. And that needs to be something we really strongly take into consideration these days. And I'm always wondering if there's not a way of doing it more frequently in a -- I'm trying to think of the word, where you are pretending you are doing it. And I

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know that -- oh, 30 seconds, okay.

I'm wondering about the time of year. Summer is when the mammals, and fish, and bird activity is highest and that seems to be a poor choice of time for these exercises. And I'll quit because my time is up. Thank you.

MR. MICHAELSON: Thank you. The next speaker is Robert Archibald.

ROBERT ARCHIBALD

Commented as follows:

Good evening and thank you for coming down. Even though it was short notice, we're happy to see you here. And I'd just like to reiterate on what Paul said, that we've had a big battle going here with the androus fish stocks and the effects of copper on them. And it's proving that they are kind of dizzying their navigational systems.

So, the timing of these exercises -- if they're -- you know, if they're going to be at the same time that we're having fish stocks coming back into this Gulf of Alaska and heading up to the Bearing Sea and Bristol Bay. And if this has any significant impact or increases any kind of chemicals in the water, copper be what it is, I don't know what you're using for munitions these days. I would have some problems with that at that particular time of the year.

I would hope that if they doubled the length of these

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exercises they would take into account the time of year for migrations. And I would certainly hope that NMFS and the U.S. Fish and Wildlife Service would have a significant impact on that, as far as giving the Navy adequate information on that.

Because I've sailed in and out of Prince William Sound a lot and it's going to be an area where there is an awful lot of mammal interactions. I so I just hope you sharpened your pencil on that one. And we don't want to see a whole lot of destruction out there with our fish stocks. So, thanks for coming.

MR. MICHAELSON: Thank you. Next speaker is Olga von Ziegesar.

OLGA VON ZIEGESAR

Commented as follows:

Hi, my name is Olga von Ziegesar. I am the Director of Eye of Whale, a nonprofit research group here in Alaska. Our mission is to study and protect the humpback whale and to educate people of the status and the health of the species.

We've been documenting the population of humpback whales in Prince William Sound and the north gulf coast of Alaska for 30 years. In 1966 the humpback whale was put on the endangered species list and protected and protected by the Marine Mammal Protection Act. In the 30 years of my

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study I have seen the population of the North Pacific humpback whale go from 3000 to 20,0000. About 5,000 of these whales migrate up into the north Gulf of Alaska to feed. This area includes the Cook Inlet, Kodiak, the Barren Islands, Kenai Fjords, and Prince William Sound, and the waters in between.

It is known that military SONAR testing is very damaging to the soft tissue in the marine mammal skulls and organs. These effects can cause brain hemorrhages, mass stranding, and even death. Mid-frequency SONAR has been proved to be very destructive to whales diving and feeding behavior. They will avoid the intense sounds by surfacing too quickly and causing conditions similar to the bends.

Now you may think that the military tests would be harmless if they were done in the winter or slightly off season, and not during the summer months when the whales are definitely most abundant in these areas. We are now finding that many whales stay in the northern waters during the winter to continue their feeding. Hydro phone arrays hung from buoys in the Gulf of Alaska have recorded whale songs and calls during every month of the year.

You will say that your plan is to have observers aboard to watch for whales. When they are present the testing will be ceased. Marine mammals can hear for many miles underwater. And from the deck of a ship a whale blow

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can only be seen if it is within a couple of miles. For these reasons it will be impossible to avoid effecting the whales and other marine mammals during any time of the year in the Gulf of Alaska.

Finally, the humpback whale population is recovering to healthy numbers. And now the Navy proposes to endanger them with intensive SONAR and explosives. It seems to me that we must change something if protecting our country means sacrificing the whales. Thank you.

MR. MICHAELSON: Thank you. I'm going to read a head again so that you know where you're coming up. Sue Christiansen will be next, followed by Amy Christiansen, Whitney Lowe, Don Lane, and Elise Wolf.

SUE CHRISTIANSEN

Commented as follows:

I to want to thank you so much for this public process. I thank you for your service to the United States and all of you in your professional roles, your expertise, your commitment to science, and research. I just found out about this today as I was flying in on Era on the same flight as all you guys. So, I'm glad I was able to be here. And what I remember, I think it was about five years ago the Navy was doing research off the coast of New Zealand on SONAR -- on new acoustics. And maybe you guys -- are you familiar with that? I heard about this from NPR

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and I've thought about it after I got off the plane this morning. But there was like a hundred whales that breached [sic], and it -- you know, it started out with about 20 and they tried to figure out what was causing the problem. And it turned out after several years that it was demonstrated or proven that it was the new acoustic SONAR research that was going on that was effecting them.

And I just don't want to see that happen here. And I know that everyone involved with the Navy or no one in the Navy wants any of our marine animals to be injured in any way or you have a good intention as well, and that you are doing the best of your -- to your abilities to protect our nation. And have the highest good in mind for all species. And I would just say, my feeling at this time is I think it's a little early for us to be doing this kind of research -- or you know, the games or the activities that you've presented happen here. And I support no action alternative at this point. And I'm not sure I support the research for SONAR, if it has the effects of breaching [sic] whales or that kind of thing. Okay, that's it.

MR. MICHAELSON: Could you state your name for the record?

MS. CHRISTIANSEN: Sue Christiansen.

MR. MICHAELSON: Thanks.

MS. CHRISTIANSEN: And I also would just underline as

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well as what Senator Seaton said about the chemicals.

MR. MICHAELSON: Okay. Thanks. Next speaker is Amy Christiansen.

MS. CHRISTIANSEN: Beaching, yeah did I say breaching. Beaching, yeah beaching whales. Did I say breaching?

MR. MICHAELSON: You did, thank you.

MS. CHRISTIANSEN: Okay, sorry.

MR. MICHAELSON: Amy Christiansen.

AMY CHRISTIANSEN

Commented as follows:

My name is Amy Christiansen, I've lived in Homer -- in and out of Homer for years. But I have some real questions for you guys that don't seem to be addressed, as in how far does the SONAR blast travel? How loud is it 10 miles away? How loud is it 200 miles away? What happens when it comes in contact with some shelf or something? I mean that kind of information, I don't think we really have.

I heard a couple people state that we don't really know that much about marine mammals. We really don't. And for me, just from my heart SONAR -- just discharging SONAR for -- I mean, I would really want to know better reasons what science you're really trying to determine here. Or what is the whole weaponry involvement? I haven't heard a link there. I mean it's nice -- the posters are nice and I do appreciate the chance to talk about it. But I don't

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feel that it's worth while if you really don't know what we're studying yet to harm any marine mammals.

I also wonder if there's a lot of this training and stuff going on in California -- I know California and Alaska are different, and waters are different. But I always wonder why -- or I feel like, they can't get away with it in California, so they might be coming up to get away with it in Alaska. And I would really like that issue addressed. Because there's more population in California -- I mean, that part is real for me. And it might be ridiculous because it is different ocean you know, waves or whatever. But some part of that is real for me. That I would like that addressed.

And more notice would have been nice. And what else did I think? Oh, like in the book -- science is always a little bit lagging is what I found. If you take sea otters, which are mentioned in your environmental impact study, they are now listed, they are now -- critical habitat has been named. And that's not included in your thick book. And I'm sure that thick book took a long time to put together, but that's something too that is apparent to me. So, okay thanks.

MR. MICHAELSON: Thank you very much. Next speaker is Whitney Lowe.

WHITNEY LOWE

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Commented as follows:

My name is Whitney Lowe, I'm here from Homer, Alaska. And as with everybody else I'd like to thank you very much for giving us the opportunity to be able to comment this evening on this issue.

The Navy has a history of poor environmental stewardship including dumping high volumes of garbage into the ocean as well as toxic materials from explosive ordinance. And consequently it is difficult to believe what they might say about being responsible for the environmental impacts of these actions. And I can understand in these times of international terrorism, it's easy to throw out the fear card and say, that all these training exercises are necessary to keep our country safe. But trumping up peoples fears has routinely led to trading off the health and safety of human and other animal habitats because supposedly it was going to make us safer.

At some point it would be great that we might learn that the answer to making us safer doesn't result from bigger and more powerfully destructive weapons, nor from destroying our surroundings in the pursuit of those weapons.

At the present moment we have a situation of drastic concern with our worldwide fisheries and marine environment. A November 2006 article in the Journal of

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Science suggested that there will be virtually nothing left to fish from the seas by the middle of this century if the current trends of catastrophic fish populations declines continue. The primary culprits in this involve over fishing, pollution, and other environmental factors.

In the face of these issues it's totally irresponsible to increase military training, which involves toxic dumping and tactics known to kill and injure marine life. We should be going to great lengths to do anything we can, not only to mitigate the current practices that are causing precipitous decline, but to reverse this trend. To engage further military exercise in this region that is extremely rich in sensitive marine life is a blunder of epic proportions and represents incredibility poor judgement.

Our children and decedents in who's hands we are going to leave this incredibility injured world will be asking us, what were they thinking? We can afford to participate in this process, as it represents the epitome of irresponsibility and drastically poor judgement. Thank you.

MR. MICHAELSON: I'm going to go a head and read a head again, so those of you know when you're coming up. Don Lane, followed by Elise Wolf, Mako Haggerty, and Todd Hoppe. Don Lane please.

DON LANE

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Commented as follows:

Thank you for this opportunity -- thank you for this opportunity to speak. This nation's security is a big and the Navy has always played a large role in the safety and security of this country. It's a large part of the success that we all enjoy, and the freedoms that we all enjoy.

Having said that, I also understand the taxpayers investment in the tools of that security, it's important to practice. And it's important to understand those tools and it space and it takes time to practice. Having said that, this map -- the western boundary of the practice area or the football field, as it described to me goes up on the shelf in the Gulf of Alaska. When it goes from dark to light is right around 150 fathom break. Now to the west of that break and over to the edge of the yellow line, that is some of the richest bio-diversity in marine fish as you'll find any place in Alaska. I have spent years out there fishing, long lining, pulling pots and from Montague Island down to off of Kodiak. There are sharks, they are skates, there are halibut, there's grey cod, they are fish there that have air bladders, they are fish there that don't have air bladders. There's this huge bio-diverse population that are -- fish that are there year round.

My concern is; is that some of that water that's up on that shelf, it doesn't show on that picture, is 150 to 180

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feet deep. It's not very deep, there are -- Portlock Bank area up there that's 35 fathoms, off of Montague Island, sticking south of that island there's an area -- it's all less than -- some area of it are less than 200 feet deep. And imagine a huge explosion on that wall and you're over here. And you're a fish on the bottom. That's about the distance between the surface and the fish if there was an explosion. So what I would like to see, while I know you need the area to practice.

There was the comment about the sinking of the ship, as the target would be in 1000 fathoms. I think it's important to consider any ordnance or major explosions that were to occur during the practice should be off of that ledge into 1000 fathoms. It's not that far to move off that shelf to deep water. It's an area of maybe five miles to break from 180 fathoms down to over 1000 fathoms.

And the difference between being that wall to this wall in a major explosion and all those fish that are laying on the bottom and 1000 fathoms is a mile. So, that would be my only is; is that western -- that western shelf there is -- when you talk about environmental impact, there's a lot of environment there. And some of it is not very far down. And if it was considered -- you know, you could drop a bomb there in any of that area, that would be a mistake in some of those areas, because it's not that

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deep.

MR. MICHAELSON: Thank you. Next speaker is Elise Wolf.

ELSIE WOLF

Commented as follows:

My name is Elise Wolf. I'm on the Board of Directors for the Kachemak Bay Conservation Society. Thank you for being here. And I'll ditto what everyone else has said. While we appreciate you coming to Homer, I have some issues. And I'm surprised that you're not in Seward because as you can see this map shows -- there's a few tourism operators, whale watching companies that probably would have something to say to you that probably wouldn't be very nice.

And I think you missed them in your environmental impact statement. You also missed Glacier Bay, I mean if we're going to mimic the French like they do bombing Tahiti, why not hit Glacier Bay too? I mean you picked two -- one of the second most important areas for tourism in Alaska other than Glacier Bay for whale tourism. So, I'm just wondering why we're not in Glacier Bay as well?

Now the only reason that you can say that there's no significant impacts on whales is because you deny the impacts from seismic sound on whales. You have been sued over this. The Navy has been sued, and you're going to be

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sued again. Not by our little company or little group down here in Homer. But by the other big environmental groups, which don't bother to come to these because they are already planning suing you. So, we can just expect that. But that's why. And the only reason that you can deny impacts on whales is because you're getting your legal advice from the tobacco industry or some other company that -- lawyers that tell you that if you wait 50 years and say that there's no correlation long enough, then everyone will start to believe it, until the suits finally start coming in, and the death toll is high that you can't deny it.

Now there is one antidotal evidence and antidotal evidence that shows that beaching occurs with whales and all the other things Olga said. There are science professors around the world that testify on this all over the globe. So, this is something that you just simply are choosing to ignore. There's no evidence to the contrary.

The other issue that you have is -- well your timings bad. But as Olga says, maybe there is no good timing. Your mitigation is inadequate. Your cumulative impacts are inadequate. Climate change shows that Ph changes are proving to increase the conduction of sound in our oceans. That's completely absent in your environmental impact statement. So, you are -- your cumulative impacts, which would include climate changes and the impacts thereof, and

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these Ph changes that we now have evidence of are completely absent in your document.

And I'm going to go a head and wait until my time is up. Thank you.

MR. MICHAELSON: Thank you. Were you in here when I talked about second helpings?

MS. WOLF: Yes.

MR. MICHAELSON: Okay, great. So the next speaker is Mako Haggerty.

MAKO HAGGERTY

Commented as follows:

Hi, my name is Mako Haggerty. I run a water taxi here, but I think for this event I'll be an assemblyman, which I was just recently elected to assembly. So, I'll speak from that standpoint. So, I want to thank you for coming here. And the displays here are very informative and I really appreciate that. I learned a lot tonight.

I think this openness that we have here is really important. And what I seen on the -- not this slide here but the one that had the deadline for the comments to the EIS is January 25th, which gives the impression that the communication is going to stop between the coastal communities here and the Navy on the 25th. And I would hope and ask you, to please keep the communication open between the coastal communities beyond that deadline.

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Because there's going to the things that we learn and there's going to be things that you learn, and I would think that a healthy exchange of that information needs to continue beyond that deadline.

And you're all real nice people. And I understand why they sent you here, because you are nice people. And we like to you know, sometimes we can be confrontational and you've -- and there's a reason for that. Is because we get the nice people and then you go on and do what you're going to do anyway. And a lot of times those of us that live in these coastal communities get a little tired of that. And so, I guess the main point is let's please keep the communication open. If there's going to be things that are going to impact the various communities in this area, we would like to be made aware of that in a timely fashion. And also if you learn anything, please let us know what that is. We like to learn things here too. Anything about the whales or the environment and we learn things and maybe you'd listen to us too. Thank you.

MR. MICHAELSON: Thank you. The next speaker is Todd Hoppe.

TODD HOPPE

Commented as follows:

Thank you. My name is Todd Hoppe, commercial fisherman here in Homer and appreciate you gentlemen coming

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and giving me the opportunity of speak. I don't -- actually could you go back to that map please.

I also am concerned about the continental shelf also. I make a large part of my living along there, and I'm concerned that Don explaining of activity along there. And you know, if say there was going to be some impact with whales and it did -- it wasn't learned until later on down the line from your things. The commercial fisherman will be the one's that are targeted first. You'll come up and do your test for 14 or 21 days, and go and what not. And down the line if something does happen it will be the commercial fisherman that are blamed for it first. In my opinion and in my experience in what we seen happen with steller sea lions and what was proven scientifically afterwards.

And I'm also was here to make a comment on a comment -- public comment you had in Kodiak that your staff was maybe aware of, that there was a suggestion that you could hire some boats to do a fair amount of fishing to try to get the sperm whales to congregate in an area outside your boundary area. And that possibility could work. But what wasn't considered in that is who's going to be -- how do I want to word that -- there's not going to be anybody responsible for the quota. That's not going to come off the quota. It will be -- I'm not wording that right, I've

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got a fart in my train there. The fish will not be accounted for. Right now we're in a quota system, every fish -- every pound that's caught is accounted for. If you have boats fishing black cod to try to pull the sperm whales out of your area -- your test area, those fish aren't really going to be eaten and not accounted for out of the quota. And that's a reverse -- negative impact on the quota. So, thank you very much for your time.

MR. MICHAELSON: Thank you. Allison do we have anymore cards?

MS. TURNER: No.

MR. MICHAELSON: Is there anyone who has been inspired by any of the other comments that they've heard to take their first opportunity to speak tonight? And by the way, I should mention we are staying until 8:30, so I did hear a couple people say they hadn't heard their questions answered regarding a couple thing. I think that maybe in a couple cases that may be because you arrived just as we were starting this. So, when we do finish this portion we're going to ask the people to go back to the stations and answer more questions if -- at least until 8:30. So, keep that in mind. I'm sorry, are you going to speak?

MS. DULMA: I'll just speak from my heart.

MR. MICHAELSON: This is your first. Okay.

MS. DULMA: I don't have anything else.

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MR. MICHAELSON: You have three minutes, and just state your name.

MS. DULMA: It will just take me a minute.

BRENDA DULMA

Commented as follows:

I just wanted to share -- I'm Brenda Dulma. And I just wanted to share what my daughter said when I just said that there was potentially going to be testing in the area. And this was her one response, how can we think about this when we have genetically unique species in our area. And that was her concern. So, I just want to share that and that may have been addressed, but -- and since I'm late, I was spending time with my child. So, I just wanted to share that. That we need to consider the bio-diversity that we have in this area, it's very unique. And that needs to be seriously considered before you make any final decisions. Thank you.

MR. MICHAELSON: Okay, thanks. Yes, go ahead. Just -- we'll get you to fill out a card later. Just go a head and step up there.

STEPHANIE ZUNIGA

Commented as follows:

My name is Stephanie Zuniga and I am a teacher, third through sixth grade as well as I used to be sea bird biologist for Fish and Wildlife Service.

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And I also just heard of this last minute through a friend. And I wish I would have heard about it before because our kids right now are studying currents. And involved with that are current events and currents in our oceans. And last quarter we studied communication. So this is a perfect -- I'd love for them to have been here tonight. And if you want to stick around until Monday to come into the schools.

So I would love to share this with my students because it's -- this is their playground, this is their home, this is where they are going to grow up and fish, be fisherman and fisher women, be tour guides, be scientists, biologists. And this matters to them and they need to be involved in this process of public comment as well.

When I was a biologist I worked in the Gulf of Alaska on the Barren Islands. And that area -- it's highlighted, is within breeding grounds of sea lions, within the main feeding grounds of sea birds and humpback whales. I mean I remember standing on -- or sitting on cliffs watching our sea birds and taking down data and looking out you know, for miles away and just seeing humpbacks feed. I mean, 20 humpbacks feeding. And you know, I'm looking just -- just in that area where that yellow is. And I'd be concerned, I'd be really concerned and I'd want to know more before just going in there and doing that. Especially that time

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of year.

It was interesting to hear Olga's comments about that all times of year will effect these whales. But they are feeding, they are getting the bulk of their food in them before they head on south -- some of them. Thank you. Thanks for coming.

MR. MICHAELSON: Thank you. Anyone else? Yes, ma'am.

MS. WOLF: So is this the time to (indiscernible)?

MR. MICHAELSON: I'm just trying to exhaust.....

MS. WOLF: Oh, (indiscernible).

MR. MICHAELSON: .....anyone who hasn't taken their first time. No, I'm not quite there yet. Thanks. Okay, I think we are there. So, anyone who would like to step up and for another three minutes. And again, all I need is your name again. Thanks.

ELISE WOLF

Commented as follows:

My name is Elsie Wolf and I'm on the Board of Directors for Kachemak Bay Conservation Society. This is a continuation of comments previously started.

For the audience, there is significant research done by Natural Resources Defense Council on SONAR and seismic testing. So this is a good website to start going in and looking at links. Don't read the environmental impact statement and expect that to be completely fully disclosed

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information about seismic testing and impact on whales or fish.

This is highly concerning. And so let's talk about mitigation for a minutes. Because your mitigation suggests that you're going to power down and shut off your engines. Well we know from what's going on in the Arctic -- seismic testing right for oil and gas development, that it's highly expensive -- very expensive for a vessel of that -- of these sizes to power down. It's extremely costly. So what happens is in the mitigation plans, note p-l-a-n-s, plan, it says that you'll power down. But in reality, Shell for example has yet to power down, because it's too expensive. So they come back a year later when they do their reports to the National Marine Fisheries Service and have in an armful or basketful of excuses as to why they couldn't power down.

And then let's talk about the people that are standing on your decks. These three people or however many. Are they going to be standing on the decks when you're out in 25 foot seas? How about eight foot seas? How about a cloudy day? How about the dark? How about five hours of daylight in the middle of the -- of you know, December 31st.

These are unrealistic mitigation plans. Now you're talking about this in the middle of summer, and this is

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probably why. Because you have 18 or 19 hours of daylight. Still, we have experts in the Arctic Ocean right now, natives who cannot identify whales, and don't know the difference between a bearded seal and a ring seal. So, if Shell is having these problems and they're doing this all the time in these Arctic waters, then I'm not sure -- I don't -- I not -- I don't have any confidence that this is going to happen.

National Marine Fisheries Service rubber stamps this stuff all the time. The fact that we are coming up with no significant impacts concerns me greatly. There's one final comment that I have to say, in that there is philosophical and spiritual and ethical proof if you want to call it, or cultural standards among most human societies that place some level of inherent of value. And what I mean by inherent value, that is the value of a being outside of the human want and desire. And that is completely absent in your plan. Thank you.

MR. MICHAELSON: Who else would like to -- yes, go a head.

ROBERTA HIGHLAND

Commented as follows:

My name is Roberta Highland and I didn't have time to prepare comments because I did just find out about this meeting. Now that I've heard the comments of people that

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really know what they're talking about in this area. I have become very alarmed. And I going to ask a question later. And what I would really like to see you do is don't go back to your stations, I would prefer that you take questions from the audience so we can all hear the answers. And I would really hope you will do that since you spent all the money and time to get here. That would be -- that's our usual preferred way of being able to communicate with you.

So when we get to that point I am going to ask about ocean acidification. And I'm going to find out what the Navy is doing about ocean acidification. And now that I've heard, and I should have figured that out, that this is really a rich area. It's incredibly rich. And what in heavens name are we thinking of even having allowed these types of activities to go on before? I am now feeling like this is a very poor place -- I don't know where a good place is. But this is not one. So, I'm going to be going on record saying, I don't what this activity going on in this area at all.

And the other thing I'm going to bring is my four E's. And my four E's is something I would like to go national, state, worldwide when anything is brought up to make decisions on. Is economy, environment, energy, and ethics. And I am trying to get this being used as a template for

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every decision that gets made. And when I talk about ethics, I mean is it ethical for the animals, is it ethical for anything? Is it ethical for the worms? Of what we're planning on doing. But when you take into consideration economy, environment, and energy -- what the kind of energy use is being taken to do any of these things. And what the consequences are. I am trying to get that nation, worldwide and you could help. And I hope you think it's a good idea. Thank you.

MR. MICHAELSON: Anyone else who would like to come up? Thank you.

OLGA VON ZIEGESAR

Commented as follows:

I also have not followed -- my name is Olga von Ziegesar. I'm from Eye of the Whale and I study humpback whales in Alaska, in the Gulf, and in Prince William Sound.

And there are huge numbers that migrate along that shelf there. And we actually don't know exactly how they migrate out in the deeper waters, but there definitely been sightings of even Southeast Alaska humpbacks up there. So, they must circle somewhat before they go to their destinations to feed. I know that there have been a lot of studies on this SONAR. It's been going on for years off of Hawaii, off of New Zealand, off of California. The last Marine Mammal Conference there were lots of papers on the

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effects of the SONAR. It's hard for me to believe that we don't know more than you're saying. And I -- I'm afraid I haven't read everything on it. But, I would propose that there be no SONAR and no explosives. I can see -- I was told that it's important that the boats come in that close so that they can fly up into these interior areas. But, I still don't really see why we should take any chances with SONAR or explosives. Thank you.

STEPHANIE ZUNIGA

Commented as follows:

I just -- my name is Stephanie Zuniga. And I just want to -- and somebody made the comment of how ocean acidification or the change in Ph in our oceans is changing the way that sound carries underwater. And I -- this is pretty new for a lot of us. And I just wanted to suggest to those involved in making these decisions with our communities to watch A Sea Change, which is a movie, a documentary that is going to be here in Homer on Tuesday night I believe. I hope everyone here gets a chance to go watch that. It's on ocean acidification and there is website, a sea change.com I think it's called. And I would suggest that that be viewed by our decision makers, as an educator. Thank you.

MR. MICHAELSON: Thank you. Is there anyone else who would like a first or second chance?

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ROBERT ARCHIBALD

Commented as follows:

My name is Robert Archibald again. And I'm looking in this booklet here, and I haven't had much of a chance to look at your EIS. But, one thing that caught my attention is when they would power down. Is that going to be active SONAR at 1000 feet or 1000 yards? And again, shut it off at 500. And I don't know if that -- I do know that at 1000 yards it's still a pretty strong signal. And I don't know the research that's gone on there. But in a high population of mammals it seems a little ridiculous to me to expect to be able to be able to provide a safe environment at 1000 feet when you're going to shut them off.

And also, I'm a little disappointed in our State for not putting up a little more -- if we have industry come in with an operation like this, they would certainly be out there demanding a little bit better information to the public than what you people are providing. And I say that myself because I haven't had a chance to review that. And I don't think it's been out -- put out to the general public. And this operation that you're proposing, be it warranted for our national security, I think you know, I don't have a problem with that. I have a problem with the destruction with the environment. And I think everybody should have a little bit better knowledge of what's going

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here, so. And I think it should be processed through the State also. And I haven't heard anything about the State being involved, so. Thank you.

MR. MICHAELSON: Anyone else? If not a couple things from a process standpoint. Can we go back to the last slide again? My favorite slide, because it tells you how you can get involved.

Again, the close of comment period is going to be the 25th. There is a lot of information there, it's all assessable on the website. Obviously you can go to which ever portion of it, there are a lot of resources to be looked at. You can go to the ones that you are most interested in.

In terms of involvement, this is the public portion of it. It's probably worth mentioning that on a mail list and outreach to all the relevant federal, state agencies that was part of this EIS. That's probably worth mentioning too. And I can see a women raising her hand who made a request. I just -- I don't want to act like I ignored it. We have a format that we're using for the past meetings, this meeting, and future meetings. It does not involve a town hall type meeting. So, I'm going to go into recess and allow the people to go back to their poster stations, unless someone has an additional comment who hasn't had their second helping yet. All right. So, would you like

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to make a comment? All I need is your name.

MS. FEILER: Linda Feiler. Before I came I didn't know about all the.....

MR. MICHAELSON: Can you pull the mike down so we can hear you? We can't hear you.

LINDA FEILER

Commented as follows:

Sorry, Linda Feiler. Before I came I didn't know about the inner bombs that were going to be dropped, the missiles, the gun shells, the small arms, the pyro flares, the dyes, the expended materials, the hazardous materials. I didn't know a lot of it, and most of the community doesn't know a lot about it because like everything else, you come into the community, bang-o we have these meetings. Nobody ever gets their questions answered.

If we have questions and we want them answered, that's why a lot of us come here. You know, because you're the ones who has the answers. I wanted to know how many pounds, how many bombs, how much toxic material is going into the water. You've done this for 40 year for 14 days, 40 years you've done it in various parts all over the United States. And I think most of us want to know where we call to get an answer because it's going to be in the newspaper. And we're going to have a dialog with ourselves through the radio station and we want to know were we call

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and where we get answers. Who's going to answer our questions before the 25th?

MS. HIGHLAND: A phone number, that's what I want is a phone number.

MS. FEILER: Yeah. A phone number, a name -- someone who's actually going to be there. And it probably should be 20 or 30 people there.....

MR. MICHAELSON: So far all of the questions I heard asked, I believe the documentation is in a narrative if you will avail yourself of it.

MS. FIELER: No. Because we already that. We already looked through the IRS [sic] and found out -- sitting with the expert here, that the answers were not in there. It doesn't say. I've asked all -- every single one of you already, how many, how many pounds, what are they made of, what are the bombs made of? I want -- we what, I'm sure because I know there's at least 10 of us here who believe the same thing. We just want answers, that's all. And we want to know how we can get answers. And if we know that we're not going to be given answers, that is going to be highly publicized. So, please let us know who will answer any questions we have before the 25th. Thank you.

MS. HIGHLAND: And a phone number.

MR. MICHAELSON: Would you like to make a second comment?

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MS. DULMA: Yes.

MR. MICHAELSON: Sure.

BRENDA DULMA

Commented as follows:

I'm Brenda Dulma, very concerned citizen. I pick up this beautiful image of a sea anemone on the front cover. And I heard an amazing story at our museum the other day. We had a -- so my question is, what is the impact of this testing on the oceans invertebrates? The story I heard was in our own museum we had a sea anemone that hasn't opened up for four months because one fish is harassing it. So, if this is the response to an invertebrate in a very safe environment, that a fish is harassing it. What are the studies on all invertebrates with this kind of testing? So, my questions is, how are the invertebrates responding and other micro-organisms that we have no impact in this web of life? So, my question is, for my third time, what are the impacts on the invertebrates and micro-organisms in the ocean habitat from the testing? Thank you.

WHITNEY LOWE

Commented as follows:

My name is Whitney Lowe. And just a one other -- couple other things I want to add in addition to my earlier comments. I want to mention you know, it was brought up too that there's been a good bit of research done with

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seismic testing in some of the marine environments around here. And the oil companies have actually found that there's a possibility of residence for seismic testing up to 500 miles in some areas. And I know a lot of the focus has been on what's going on with certain marine mammals, such as the effects on whales. But the other thing I would ask you to really think about is that nobody is also taking about -- the whales aren't the only creatures in the ocean and we don't know how this might effect sharks, fish, other animals that are not coming up and beaching themselves that are likely to be affected by this as well.

So, while there's a lot study on certain marine mammals, like whales the very fact that we know this is killing a number of marine mammals, would ask us to think, maybe this is also having other damaging effects on other marine life that we really don't know about it. Is this really a good idea to engage in it. Thank you.

MR. MICHAELSON: Thank you. Did I see someone else who have something they might want to say?

ROBERTA HIGHLAND

Commented as follows:

I just have to wonder you know, I was talking to everyone presenting and I think that we have come a long way. And that people just don't throw their trash in the ocean anymore they used to, hopefully. I think the Navy's

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probably come a long way, and they've hired scientists and they've hired environmentally conscientious people. But I still say, we are moving to fast at this point to just keep going. At some point the environmental impact has got to be totally important to each of us. And most important. So, I'm glad that there are better things happening all over the place. But I'm also worried -- what is your munition? What are you throwing into the ocean? I think I have a right to know. I mean is that a question of defense? Because if I know then some Arab might find out? To bad, I want to know what you're throwing in the ocean. And I have a right to know.

What the difference between D-U and agent orange? Okay. That's it.

MR. MICHAELSON: Thank you very much for coming tonight. We're only going to have a little bit of time left here at the poster stations. But, let's take advantage of what we have. And I've had -- did you not have your second chance?

UNIDENTIFIED VOICE: How.....

MR. MICHAELSON: We're not going to -- just to be clear. We're not going to do a town hall. If you have a comment I need you to make it there, it will be recorded on the transcript. If you have a question that you want to have answered tonight, I need you to go back to the poster

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stations. All right? So, I think that all you probably have is a question, right? Right. That's what I thought. Okay. So we're going to adjourn this portion of the hearing and go back to the poster stations. Thank you very, very much for your hospitality and asking us into your community, and we appreciate you coming.

(Recess)

GENEVA CRAIG

Ms. Craig was seated next to Ms. Feiler

Comments read by Linda Feiler:

Okay. I'm speaking for Geneva Craig, who is 91 years old. And this is what she has to say:

I believe in life. I do not believe in killing any living creature. The oceans are full of life. My reason for being a long time vegetarian is to avoid having any creature killed on my behalf. How could you practice bombing and not kill? I am strongly against any practice that will harm, stress, or kill in the ocean or on the land.

I once supported the military because I believed it would prevent death. But now I have seen that we need to mend our ways and negociate or learn ways to have peace. That was from Geneva Craig, who lives in Homer.....

LINDA FEILER

Commented as follows:

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.....and my name is Linda Feiler, and I live in Anchor Point. Unfortunately my brother has brain cancer and I told him I was coming to the meeting, and he wished me luck and said, it's pathetic that we even have to comment on issues like this. I believe that we've done enough damage to our food sources and enough damage to our environment, enough damage to our seas and land. And that I don't believe that it's necessary for anyone to practice harming something else, killing our food sources, or killing our wildlife in the name of the military. If you need to kill in order to help us, what good does it do? Thank you very much.

JASPER KIGAR

Commented as follows:

My name is Jasper Kigar, I live and work in Homer, Alaska. I'm very impressed with the U.S. Navy's presentation and importance that they're placing on protecting marine animals. And I'm confident that the U.S. Navy is doing it's best to protect marine animals in the area in any of its activities.

I understand after today that the U.S. Navy uses local fishing fleets and boat fleets in its war games as decoys and targets or for other purposes. And I would encourage the U.S. Navy to continue to use these fleets and to use more local Alaskan vessels in its activities in order to

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stimulate the local economy. Thank you.

MR. MICHAELSON: This is Lewis Michaelson, it is now 8:30 p.m. here in Homer. We have concluded and are adjourning the formal portion of the project -- excuse me the public hearing although we are going keep the poster stations open for a short time because there is a fairly large crowd here still asking questions. Thank you.

(Hearing adjourned)

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TRANSCRIBER'S CERTIFICATE

I, CLYDE PASTERSKI, hereby certify that the foregoing pages numbered 4 through 57 are a true, accurate, and complete transcript of Hearings held in Homer, Alaska on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement transcribed by me from a copy of the electronic sound recording to the best of my knowledge and ability.

_____

Date Clyde Pasterski, Transcriber

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PUBLIC HEARING ON

GULF OF ALASKA NAVY TRAINING ACTIVITIES

DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

January 11, 2010

5:00 p.m. - 8:30 p.m.

Juneau Arts and Culture Center

Main Hall

350 Whittier Street

Juneau, Alaska 99801

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written statement, and you may turn it in to the registration table or you may read it out loud if you can do so within the time -- three minute time limit.

Finally, please honor any request that I make for you to stop speaking when you reach the three minute time limit. In order to make that easy for you to do, I have two little signs here. I'll hold this one up when you have 30 seconds left of your three minutes, that makes it easy to find a comfortable place to wrap up. And then when we reach the three minute, I'll hold up this one. I think the meaning is pretty clear with that. Okay?

So we are now ready to begin with the first speakers. What I like to do is read several a head, so that you can get an idea where you're coming up in the rotation, so I don't surprise you when I read your name. So the five that I have -- I apologize in advance for mispronouncing names, it's inevitable. Greg Brown, Lynn Wilbur, Alex Simon, Andrea Doll, and Jan Christian, Cripton [ph], Crichton, who knows, I'm sorry. I'm sure she'll tell me when she gets up here or he does, it could be either. So again, Greg Brown please approach. And just keep in mind all I need is your name. I don't need address, serial number, or any of that good -- just a name so that we know in the transcript who was speaking.

MR. BROWN: Ready?

MR. MICHAELSON: Yes.

GREG BROWN

Commented as follows:

Okay. My name is Greg Brown. I have no military experience, but I am a licensed commercial pilot. I'm also a licensed boat captain. And I've operated a little bit in Alaska. Live here in Juneau.

And although I'm opposed to this exercise -- I'm not comfortable at all with the analysis regarding the air pollution and the water pollution associated with it. My biggest issues is the Navy SONAR activity. I found it pretty questionable when I asked why this had to be done in one of the richest areas in the world for marine mammals and fish activity. And why it had to be done in May and June. And the response was, well for safety sake we -- that's the most calm weather for us to do that. And anybody -- all of us in Alaska, we go out in weather in November, December, and January. We seem to be able to get through it okay. So, I think that was a pretty -- that's not a very good comment in opinion.

I am very concerned about the whales. I make -- I do whale watching in addition to other activities here in Juneau. And I'm not at all comfortable that we really know what the effect of this -- the SONAR, this high intensity SONAR will do. Thank you very much for your comments and

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thank you very much for letting us make these comments.

MR. MICHAELSON: Okay. Thanks for getting us off to a good start. Lynn Wilbur.

LYNN WILBER

Commented as follows:

I'm Lynn Wilber. I just want it on the record I came from Sitka. There's quite a few concerned folks over in Sitka as well, couldn't make it due to the short notice.

I have quite a few concerns. Air quality is supposed to be 123 fold increase of emissions, including green house gas emissions. There's only going to be a 3000 foot window and then you're not going to consider. You think that these emissions, pollutants will disbursed through precipitation or dealt with. No mitigation plan.

I'm sorry, I support the no action alternative on that one. Expended materials, the pollutants involved in that are heavy metals, tungsten, which is toxic to marine life. Fluoride compounds, which is toxic. One hundred and fifty times the safe level of hydrogen cyanide, these are all from bombs, and sonobuoys and other training materials -- also plastics. I'm hoping people are following the issue we're having in the ocean right now with plastics building up in gyre, and taking pretty much over the Pacific.

That's a problem to me and I don't see that you've got much of a mitigation plan for that. I think you're 360

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percent increase on that one, in your alternative two. So, I support the no action alternative on that as well.

On fish you agree that there's not a lot of studies done with sound. There's a lot of disagreement exactly on how to approach, using controls. You mentioned Grey literature, yet you reference your own documents, and letters, and impact statements invalidating your -- no basically not much of mitigation as far as fish are concerned. And I can go into more detail later, because I'm going to run out of time. But I'm going to support the no action alternative where fish are concerned.

And marine mammals, this is probably where it's going to hit home for a lot of people. I too, am concerned about SONAR. Beaked whales are the most vulnerable because they're deep divers. And in the Bahamas in 2000 there were some expert witnesses that can attest to what happened there. I just don't think that in the Gulf of Alaska your Beaufort 3 conditions are going to be not be really good for spotting whales. Whale experts have made the comments that you really can't spot whales very well in anything over a Beaufort 1 in the Gulf of Alaska.

So, the use of onboard spotters, and you mentioned maybe possibility ariel craft if the conditions are right and if they have time, is how I interrupted your mitigation on that. I just don't think that's suffice. So, again I'm

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supporting the no action alternative. It seems like you've dismissed a lot of recommended mitigation's. You've got a series of them, you've got a lot of them you've dismissed. Including recommendations from NOAA. And I can go into that in a little more detail if we get to a second round. But I'm running out of time. So, again I support the no action alternative. Thank you.

MR. MICHAELSON: Alex Simon.

ALEX SIMON

Commented as follows:

Thanks for the opportunity to speak. So my name is Alex Simon. I did have a chance to speak with some of you before and one of the things that impressed me, you seemed like well intentioned individuals.

I think the reason why I'm supporting the no action alternative. Well there's several reasons. But one of the things, if we look at the history of the military in the United States, there's a long history of very well intentioned people concerned with national defense. Implementing programs that result in long term environmental health.

And so, before I lived in Alaska I lived in Utah. And some of you might be familiar with down winders. These are victims of above ground atomic testing in the 1950's. And so there's still people alive today who -- and I've met

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many of these individuals, who suffer from cancers and other effects. And I think you know, if you look back then we were facing you know, the Soviet Union. An adversary that was using weapons that were pretty much comparable to what we had, as far as technology. And that -- I think that was a case of well intentioned individuals, very concerned about national defense, like yourselves. And I worry about those mistakes being repeated.

Particularly, back then we were dealing with concerns of human life. I assume the bar is set lower for your concerns about marine life.

A second point is I think that geo-politics have changed substantially since then. Military realities that we're facing, really our main adversary at this point at least, I realize there are potential for others to come along. But, is Al-Queda, Al-Queda doesn't have a Navy. That -- none of our adversary's really have advanced Navy's. You know, I mean if we look at you know, Iran, et cetera. That we're spending as much now on the Military as all the nations combined. I really, I know, the case could be made better back in the 1950's that it was critical that such tests be conducted. I don't really think this is critical for national defense.

A third point that I would like to make. If we look at the local fisheries. There's many thing --

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unfortunately whether or not this testing is done, the fisheries, the aquatic life, they're already under a lot of stress. And so locally, of course the lands rising faster than the oceans, is that many of the local salmon runs apparently go extinct due to global warming. That there's already all kinds of problems. I think to step in and exacerbate those problems seems unwise. Okay. That's all I have to say. Thank you for your time and consideration.

MR. MICHAELSON: Then next speaker is Andrea Doll.

ANDREA DOLL

Commented as follows:

Well thank you -- thank you for giving me the opportunity. I am not a member of the military, although I've been a military dependent wife for over 30 years. My husband was a DESERON Commander that did exercises in the Gulf for as long as I can remember. And then I had the opportunity to serve the public as a legislator and was on the Military Affairs Committee.

So, I'm very interested in what's going on here tonight. And my suspicion is that this huge military machine is moving forward and it's going to take an awful lot to stop it. We have been in that no action alternative for some time, not using SONAR up here. But now the Navy wishes to go not only to one, but they want to go to two. And I am not quite sure just what kind of testimony you're

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going to hear tonight that will change this machine that's moving forward, to stop that moving and go back to the no action alternative.

I am very interested in hearing comments on that from the military and to see exactly what kind of effect this will have -- our testimony here tonight, on you. I think that is fairly much what I wanted to say on this. I did want to point out that while I was in the Capital I was mailed those circular things that you turn around and you can see what kind of whale you're looking at. When you tell me that the Navy is going to be trained on these watches, where they stand on the destroyer and they look out and they see some movement, and then twirl that little card around and say, I want to get to -- let me get to the control tower here and talk to you about this -- you know, I mean it's really pretty laughable actually.

So, I am hoping that by this testimony you will be able to show us what areas we will be able to have a real effect on when you start these exercises. I know there are some things the Navy must do, they have to do. And there's no give or take. But there are areas that there are give and take. How can we effect those areas, how can we really have that impact? That is what I would like to know and would like to get some kind of response on. Thank you very much.

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MR. MICHAELSON: I'm going to go a head and read ahead several names. Jan Crichton, Mark Anderson, Victoria, I'm not sure whether it's Dance or Banof [ph] or something else, and James Voelckers. Jan.

MS. CRICHTON: It's Jan Crichton.

MR. MICHAELSON: Say it on the microphone.

MS. CRICHTON: It's Jan Crichton.

MR. MICHAELSON: Okay.

JAN CRICHTON

Commented as follows:

Hi. Alaska already has a long standing problem and history.....

MR. MICHAELSON: Just pull it up to you so we can hear.

MS. CRICHTON: Alaska already has.....

MR. MR. MICHAELSON: Thank you.

MS. CRICHTON: .....a pretty long standing problem with leftovers from the military. All kinds of health and environmental issues where the military has been real eager to go in and do exciting new things. And then left and dumped problems and toxins for future decades to have to deal with. And the cost has been really high to all of us.

Also, Alaska is one of the last places that has a really viable, healthy marine mammal population. But they're stressed our. They're going to start experiencing

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problems, some of them already are. The pinipits and marine mammals are already going down in population, and we don't even know why. I think it's unwise to start shooting off active SONAR in their home waters. Especially during the summer months, which are very critical to them for feeding and everything. We have a short summer, they need that. They need to be uninterrupted. I would have to support the no action alternative simply because it does not include any active SONAR, and that's the thing that concerns me the most.

We know that it has already caused problems off California and I don't think the negative impacts that have been happening there have even been researched. It's not a time for us to turn around and start doing this in Alaska waters. I think the problem of potential impacts on marine mammals is not acceptable or reasonable given the perceived need to these repeated active SONAR exercises when I don't really see any good reason to do it. That's basically it.

MR. MICHAELSON: Thank you. Mark Anderson.

MARK ANDERSON

Commented as follows:

Yeah. My name is Mark Anderson and I am also in support of the no action alternative. I find the analysis has overlooked, and I think made some incorrect conclusions. Cultural resources, native people, and

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actually all people of Alaska consider our wildlife a cultural resource. So, I think if you are having an effect on wildlife you are effecting cultural resources.

Socioeconomics, a large developing industry in Alaska is marine mammal observation. Also, bird observation. I don't think you've done a good enough analysis on effects to birds, of which there are millions and millions of sea birds out there in this area at this time. May and June is a critical time for them. A lot of them have flown from the Southern Hemisphere to get here. We have very large migration routes and if something upsets them along the migration route. We've been having some serious problems. I don't think you've done enough research on what happens to fish. Most fish have an air bladder that is going to be negatively effected by a sound blast. We know that sound does have an effect of fish, and I don't think you've actually studied that enough to know what is going to happen to the fish.

Alaska has a long history of cooperative management between the State and the Federal government. And that's why we still do have marine mammals and fish here. But, they are stressed. We have several endangered species that we're talking about here. And I think that the Endangered Species Act has been really overlooked in your analysis as well. I guess that's really all the comments I have. I

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think -- I'm not sure you're going to hear a lot of people supporting alternative one or two here tonight. I think that the current level of operations in Alaska is acceptable. And I think you may just be moving to Alaska because you think that you can get it done -- you can do it here where you've had quite a bit of public opposition to doing it down south and in other areas where you've tried this before.

So, those are my comments. Thank you.

MR. MICHAELSON: Victoria.

MS. DANCE: Can someone put up the slide of the NEPA process again?

MR. MICHAELSON: All right. We can probably pull that up. Could you make explicit records though, because they won't be able to see that in the transcript.

MS. DANCE: Okay. So, it's actually Dance, like what you do on Saturday nights.

MR. MICHAELSON: Thank you.

VICTORIA DANCE

Commented as follows:

Victoria Dance. And I'm wondering if this process is genuine in it's intent. Because I know that you went through the process in -- or the Navy went through the process in Southern California when you used the SONAR. And there was a protest, and one of the outcomes of that

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protest was a lawsuit that banned the use of the SONAR. But then the courts lifted the ban, and they went a head -- the Navy went a head and used the SONAR that they're wanting to use up here. That was in August. Two weeks later three great blue whales were reported as floating dead in that area, the localized area. And then October 2nd another was found dead off of Big Sir. And then another washed on shore in Fort Bragg. So, when there's talk about protective measures and those protective measures being to localize. What we see in -- and of course we can't prove, that those whales were damaged by the SONAR. But there's a migration pattern you know, how can you localize it? I mean you can really localize it. So, that as a protective measure, I don't think that's realistic.

And then the other protective measure mentioned was about minimal impact. So, I guess I'd want to know what the definition of minimal is, because those are three -- those were instances that became visible. But the unfortunate thing about the ocean is that there's so much that is invisible. And that was referred to very nicely by some previous comments about what we can see that has happened in the Navy's training to birds, and environment, above -- in the air.

And so, I'd have to say I question the genuine intent

of the Navy stewarding the environment. And I'm really kind of offended that you use it. I'm questioning this process that feels like a charade when we see what happened in Southern California. And I forget the fellows name who mentioned that he felt like it was -- or Jan -- well, I'm sorry that I can refer back to some wonderful comments. But I can refer to Andrea's suspicion that this is a machine that is going to be difficult to stop. And then also, Jan's comment on not enough adequate research. It's only been a year since these events happened in Southern California. And here you're wanting to go again without really understanding what you're doing. Thank you very much.

MR. MICHAELSON: The next speaker is James Voelckers.

JAMES VOELCKERS

Commented as follows:

Hello, my name is James Voelckers. Thank you for the opportunity to speak. I want to express my gratitude first off to the Navy for keeping us well defended, and other military institutions. However, I believe there are a number of points that they have not considered or that are getting overlooked.

You mentioned realistic training a number of times. Yet, as was brought up before we don't really have any enemies with naval capabilities. It seems like the

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terrorists certainly don't. So that leaves China or Russia. With the proliferation of spy satellites it seems very unlikely that they would be able to attack us with any sort of sizable surface craft, which brings me to submarine detection. Which is what I think many of us are here for, with the SONAR, active SONAR. That seems like -- the only use for it if we know that they're there. And if we know that they're there, then I mean, they're not doing what submarines are supposed to do. Which is, I believe initiate a first strike. There are way to few ships to prevent such a first strike, so this seem to me to be a moot point. We can find them if we know they're there.

Secondly, I would wonder why exactly why we are doing this hear. This was just brought up, it happened in California, to much public outcry. Which is why I think perhaps, you'll try here for a lighter population density so, less protest. However, Alaskan waters are some of the most -- most fertile in the entire world. Especially this area which is very pristine. And as you said, that you were only going to be doing this in the summer months, that that's when I believe most marine mammals are feeding in these fertile waters. They go to Hawaii, I believe in the winter.

So, why would our enemies, if we have them, be they China or Russia, not attack us in the winter when you

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haven't trained, or during a storm. It seems like it's a sunny day situation to be running a lot of naval exercises on sunny days and good weather in the Gulf. Whereas, if somebody actually did have harmful intent, it seems like they would want to hit us when a, we could be least likely to respond. So, I would question why you were not using the winter weather to be fully prepared and fully trained.

And so in conclusion, I believe I would ask that some of these activities could not be carried out instead in the deep waters of perhaps the Hawaiian coast or other Pacific where they wouldn't, as adversely effect the ocean. I realize you will probably do whatever you have to do. Which is your job. But here perhaps is not the best location. Thank you.

MR. MICHAELSON: I'm going to read forward again. The next speaker will be Tina Brown, Dixie Belcher, Frank Bergstrom, Henry Larsen, and Murray Walsh. Tina Brown.

TINA BROWN

Commented as follows:

I'm Tina Brown. I support the no action alternative also. The other alternatives pose to many air and sea pollution problems. And the Navy SONAR testing endangers marine wildlife. We've listed birds, fish, turtles, whales of course, all marine mammals.

Not even the Navy knows all of the behavioral and

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physiological effects of SONAR testing on marine life. Clearly the Navy needs to train. But choosing some of the most prolific marine wildlife areas in the United States, if not the world, particularly at a time when migrating marine life is there is irresponsible. This is not the place to practice. And the time you chose is not the time to practice there. Not the place and not the time. Thank you.

MR. MICHAELSON: Dixie Belcher.

DIXIE BELCHER

Commented as follows:

My name is Dixie Belcher, I'm with Turning the Tides in Juneau. Turning the Tides raises awareness about what is happening to the ocean and the effect it has on human health. I want to speak especially to the 360 degree increase in water pollution and the 123 fold increase in air pollution. The ocean is 71 percent of our planet. It provides food, and according to Dr. Sylvia Earle, up to 85 percent of the worlds oxygen. We cannot live without the ocean.

We have dumped millions of tons of poisons, chemicals, radioactive waste, and other garbage into the ocean. Some whales and other sea mammals can now be legally classified as toxic dumps. We have thousands of dead zones where nothing grows. The largest 1000's of square miles. We are

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finding fish with cancer. What are we thinking?

The ocean is in fragile health. Ocean scientists often refer to their work now as, documenting the decline. If we are to survive we must stop contributing to the demise of the ocean. We must stop using the sea's and the life within them as toxic dumps to do with as we please. I believe the greatest threat to the United States and to the planet is irretrievably damaged ocean.

Please consider if SONAR testing and military dumping are contributing to the health of the ocean or furthering its demise. If it's impossible to stop SONAR and additional poisoning of air and water from military exercises, please use the no action alternative. Thank you.

MR. MICHAELSON: Frank Bergstrom.

FRANK BERGSTROM

Commented as follows:

Gentlemen, lady I would -- I've got very brief comments here. Not particularly well prepared for them. But it's surprising to say, I would like to thank the Navy for fulfilling its mission. I would like to thank you for training for that mission. I would like to thank you for training all the young sailors and aviators, daughters and sons that come from our communities to join the Navy to protect this country. You do a great job. And I

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appreciate it very much.

I would like to thank you for a careful analysis of this issue. I can't think of another nations military in the world that would go to such efforts to do their job and to take care of the environment at the same time. I would like to thank you for coming to Alaska to fulfill that mission. I would only ask that when you do, you might stop into Juneau, buy some gas, get a burger or two, and spend some time. Thank you very much.

MR. MICHAELSON: Mr. Bergstrom, I just need to ask you -- if you could just say your name for the record.

MR. BERGSTROM: My name is Frank Bergstrom from Juneau.

MR. MICHAELSON: Thank you very much. Henry Larsen.

HENRY LARSEN

Commented as follows:

Gunalcheesh. Ya'x gu 'oo, my English name is Henry Larsen, L-a-r-s-e-n. I too am opposed to against the -- what was that?

(Mr. Larsen conferred with Ms. Wilbur)

I too support the no action alternative. I think you need to -- the Navy needs to do more studies on the fish and the marine life you know, too. I think they need to do that because, I was talking to somebody earlier, and I too am a captain. I have a 200 ton license. And I've traveled

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from Sitka to Seward and I've seen fur seal -- fur seal and sea otter 22 hours offshore. And that's in that yellow area you guys were thinking about testing. That's all I have to say. Thank you.

MR. MICHAELSON: Murray Walsh.

MURRAY WALSH

Commented as follows:

Murray Walsh. I would extend my compli -- first of all welcome to Juneau. I guess I don't think anybody's said that to you yet. You may not feel all that welcome right now. But I should say that people who do get up and speak in setting like this show a little more courage than those that don't. And I have to admire that even if I disagree with almost everything I heard.

But if you want a test a public speaking, go back to 1974 when the Navy was not doing any of this kind of environment work. I was an employee of the State of Washington, and I had to be the one to tell the Admiral there in Seattle that before they could build the Bangor Submarine Base, they were going to have to talk to the State of Washington first. You talk about public speaking.

I guess I'd offer a little perspective. The actual amount of activity that the Navy is proposing to do in the Gulf is insignificant compared to the other human maritime activity that is already there. You've got a season coming

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where you're going to be operating at the no action alternative. Maybe make some notes about what happened, how many times you did change an exercise because you saw whale or whatever it is. And come back and tell us about that. Then go a head and go to alternative two and keep track of it. And reevaluate -- if you are killing whales right and left, then it's time to go back to something else. But we don't even know. And so -- and this is a decision that you get to make every year. So, it's important to pay attention to the environmental matters. I admire you for doing it. And Al-Queda does have a Navy. It's housed in Iran right now and North Korea. Those countries both use the Kilo submarine, the quietest submersible fighting ship in the world. Yeah, I want you guys to be able to find them. Thanks.

MR. MICHAELSON: Allison, has anyone else turned in a speaking slip since then?

MS. TURNER: No.

MR. MICHAELSON: Okay. Then usually what happens at this point is other people get inspired. Perhaps by people you have already listened to whether they turned in a card or not. Do you have another one for me? So is there anyone else who hasn't taken advantage of the opportunity to speak tonight who would like to do so at this time? Good, Dan Holt.

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DAN HOLT

Commented as follows:

Thanks for coming. My name is Dan Holt. I applaud you guys for coming and actually doing this. Because most of the time, as far as the military is concerned we hear about it afterwards, after it's done. So, this is great that we have this ability to comment. And I guess if -- if it's true that the SONAR is actually killing off whales, such as the one lady said -- gave a good illustration about Southern California. Then I think that's a good idea to do the -- to oppose it. But otherwise, I'm all for alternative one. Getting in there and learning more and keeping our best interest at heart, and keeping on the cutting edge of research and development.

That being said, I'm also with the Civil Air Patrol here in Juneau, Alaska. And I wondering if there's any way our group, as far as the Civil Air Patrol can help out with your exercise, so. And I've actually put that on my card. Thanks.

MR. MICHAELSON: Anyone else that would like to come forward at this time? With that, you may have heard someone make reference earlier to a second chance, a second helping. We're here until 8:30, and we'll go back to the poster stations. But if there was something that you neglected to say the first time around and you would like

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to come take advantage of a second chance, we can do that too. So is there anyone who would like to add to the comments they've already made?

MS. WILBER: I would.

MR. MICHAELSON: Go a head. Give your name again.

LYNN WILBER

Commented as follows:

I'm Lynn Wilber. I've heard some interesting comments. One of the things that I wanted to fit into my comment was the left over materials from the military. Anybody who's hiked around Sitka knows that we step in stuff from World War II all the time. Bins of oil, weird liquids, I have no idea what they are. And its been a tradition of the military to not deal with the mess that they've made.

I appreciate our military, I really do. I appreciate the work you do. And I appreciate that you're training and preparing. But the lack of a mitigation plan is just astounding to me. And the overwhelming opposition you've received in every training range, it doesn't seem that you've taken these public comments to heart. One other thing I want to make clear is the Navy is undergoing or going through the NEPA process because they were court ordered to. They were taken to court and the court ordered you to do this. So they've been training, in fact the

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Atlantic Fleet Training Range is operating on a no action alternative, which is similar. There are other alternatives -- toning down the exercises and not using SONAR. And they did that and they didn't go through the process, from my understanding from reading the news and following the time line.

There's a lot of information, available congressional reports, things on the internet that you can read. I like to enter into these types of debates with an objective mind. And I've heard other people who are -- whether they're experts, whale biologists, scientists, ex-military say that they wanted to go into this objectively. And just couldn't because of the gross negligence, the lack of mitigation. Some of the measures that have been recommended to you for decreasing the chance of harassments or takes on marine mammals have been dismissed. I'd said I was going to try to get back to that. You talk about in the impact statement, you talk about an unusual stranding event. Where NMFS gets involved and tries to recover if there's a dead animal or a mass stranding. They apparently don't have and nor do you have in place yet a stranding response or communication response.

And I'm sorry, I actually thought I had a little more time than the three minutes. But this is just not acceptable. Thanks again.

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UNIDENTIFIED VOICE: I'd like to give my three minutes to the woman who came all the way from Sitka. If she had a few more comments that would be fine.

MR. MICHAELSON: Actually we don't do that. We don't trade times. If you have something more you'd like to say -- yeah, no that's not our procedure. Sorry. Is there anyone who would like to append their comments with something they didn't get a chance to say? Yes sir.

MARK ANDERSON

Commented as follows:

Yeah. This is Mark Anderson. I guess the thing that occurred to me as I was sitting and listening to some other comments is, you have three alternatives here. And I don't think that is a reasonable amount of alternatives to really have. I think there are a number of others. You don't have any alternatives that have increased science, increased -- you don't even mention any alternatives where you would be doing some studies before you actually go do your testing. So, I think that you need to go back to the draft EIS and develop some more alternatives that do take into account more scientific study, a slower approach. You may be able to get to a higher alternative in your mind by actually doing these things first. Otherwise, I think you're probably going to be running into another problem with litigation. Thanks.

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MR. MICHAELSON: Anything we have not had a chance to hear yet tonight? As I mentioned we are here until 8:30, so whenever we're done here we're going to go back to the poster stations in case anybody has any questions. I know a number of people arrived just as this was starting.

TINA BROWN

Commented as follows:

I'm Tina Brown again. And I just want emphasize the obvious. Once an animal is dead, it's dead. And going back to see why it died doesn't bring it back to life.

MR. MICHAELSON: I think we're wrapped up here. I appreciate everyone coming out tonight. Again, we're going to go back to the poster stations. We're hear until 8:30. We very much appreciate you coming out and we look forward to you taking an interest in the final EIS when that done. Remember the deadline is January 25th for comments. We're in recess.

(Recess)

MR. MICHAELSON: This is Lewis Michaelson, it is now 8:30 p.m. in Juneau, Alaska. We've not had anyone else come forward wishing to speak on the microphone, on the record to the assemblage here. So, we are going to officially conclude and adjourn this meeting. Thank you.

(Hearing adjourned)

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TRANSCRIBER'S CERTIFICATE

I, CLYDE PASTERSKI, hereby certify that the foregoing pages numbered 4 through 44 are a true, accurate, and complete transcript of Hearings held in Juneau, Alaska on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement transcribed by me from a copy of the electronic sound recording to the best of my knowledge and ability.

_____

Date Clyde Pasterski, Transcriber

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I.7.1.5 CORDOVA

PUBLIC HEARING ON

GULF OF ALASKA NAVY TRAINING ACTIVITIES

DRAFT ENVIRONMENTAL IMPACT STATEMENT/OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

January 12, 2010

5:00 p.m. - 8:30 p.m.

Orca Adventure Lodge Café

2500 Orca Road

Cordova, Alaska 99574

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all of the hearings so far. So with that let me read the four names that I have, so you know what order you're coming up in. I apologize in advance if I mispronounce anyone's name. Rosemary McGuire, Charles Weaverling, Ellen Americus, and Kristin Smith. So, Rosemary if you'd come up here. And all I need is your name. You'll note that I the lectern pointed kind of towards us, because the idea is that we're addressing the panel here and also if I don't do that you'd never see the sign when I hold them up. All right?

MS. MCGUIRE: Yeah.

MR. MICHAELSON: Thanks.

MS. MCGUIRE: Is this the microphone?

MR. MICHAELSON: Yes. Please pull it down.

ROSEMARY MCGUIRE

Commented as follows:

Okay. Sorry to call you guys all back like this. I sort of didn't quite understand how this was going to work out. But I do think it was important that we all get a chance to hear some of what, we as a community -- some our concerns might be.

Personally, I listened carefully and looked at the posters and stuff like that. It seems to me that there is a good deal of uncertainty about why, when, and how often marine mammals such as whales are impacted by SONAR. But

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it's very clear that it does sometimes cause mass strandings and it can cause mortalities. And it seems to me that since we don't know why, we ought to be very careful about using it. I would prefer not to have active SONAR used in the Gulf of Alaska. Our livelihoods do depend on having a working ecosystem out there. And I'd really appreciate it if you guys would consider going with the same level of activity that you're doing now, which does not include active SONAR. So, thank you for your time.

MR. MICHAELSON: Thanks very much. Our next commenter is Charles Weaverling.

MR. WEAVERLING: Hello, my name is Charles Weaverling

MR. MICHAELSON: Pull the microphone down just a little bit closer to you.

CHARLES WEAVERLING

Commented as follows:

My name is Charles Weaverling. I'm the former mayor of Cordova. I organized and operated the wildlife rescue fleet during the EXXON VALDEZ oil spill, and I'm a former Navy submariner. Qualified in diesel electric and FBM's.

I'm very concerned about this proposed increase in training activity. And I'm not reassured by the posters and the comments I've seen here tonight. I do not think that it would be a positive impact on wildlife and

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fisheries to increase the training. I don't think it's a positive impact given the training that's used now. But active SONAR, especially the newer SONAR's that are available, are certainly more effective than SONAR's that were used in the past.

I don't think it would be a neutral impact on the wildlife and the fishery. This area has not yet recovered from the EXXON VALDEZ oil spill. I think it would be a negative impact on the fishery, the marine mammals, and the wildlife in the proposed area.

This is a very rich biological area. And we depend on a healthy marine environment for our livelihood here. Activity in the wintertime, though I'm not a biologist, I understand is less productive during -- is less productive for -- is less used by marine mammals and fish during the wintertime. But even given that, basically I would prefer to see the level stay at it's current level or reduced. Thank you very much.

I'd be happy to answer any questions, but I guess this is not a discussion. Thank you.

MR. MICHAELSON: Ellen Americus.

ELLEN AMERICUS

Commented as follows:

Hi, my name is Ellen Americus and I'm just a resident of Cordova. I used to live a Hatcher Pass and there was a

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lot of air activity over Hatcher Pass, in a pristine environment. And socially I think it really upset a lot of people who recreated there. And I see that the Gulf of Alaska is a wild place, and that area in particular. And I think that bombs and missiles in that area and a lot of aircraft would be upsetting to citizens and wildlife. And I'm especially concerned about when the missiles and the bombs breakdown in the water, and so there's like lead, and heavy metals, and when that stuff goes through the food chain and bio-cumulates. And you know, it's going to effect these people. And you know, I don't have -- we've learned a lot about plastics and how harmful plastics are in the food chain. And heavy metals, that's even scarier to me. So, anyway thank you.

MR. MICHAELSON: Thanks very much. I know public speaking is a challenging thing and we appreciate it someone has the courage to do that. Thanks. The fourth speaker I have here, the last one I have a card for is Kristin Smith.

KRISTIN SMITH

Commented as follows:

Hi, I'm Kristin Smith. And I'm here speaking on my own behalf. My day job is working as a nonprofit director for the Copper River Water Shed Project, which is committed to sustainable economic development. And so I have a lot

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of interaction with fisherman and folks in this area, and what I often tell people is that what we have in this region, both down here in Cordova and up river, is a wild salmon economy. We have a commercial salmon economy, we have a subsistence salmon economy, both here and up river. And we have a sport fish salmon economy. And all that's happening because those fish are rearing and growing to adulthood out in the Gulf of Alaska and in the Pacific Ocean. That is where they live. And that is where this town's livelihood comes from. And I'm only repeating what everybody else has already said, but we do not want to see SONAR in this region because of the effect that it could have on fish and wildlife.

And I admittedly took a very quick, cursory look through there on the posters, but I saw words like anticipated. We anticipate this won't have very much effect. That's not good enough for a whole town full of people, both here and up river that depend on fish for their livelihood. And I think it doesn't just Cordova, it effects other towns in the sound and Yakutat, and other areas along the coast. So, I think it's critical that the Navy think very, very hard about the effects that this has on wildlife.

And I think that when the Navy started, and maybe other entities started using SONAR, the effects weren't so

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well know. But we know a lot more now then we did 20 years ago. We know that it has harmful effects on marine mammals. And knowing that -- you know, I understand that you're probably thinking, hey we have a lot to do with -- we have to protect national security. Well, in my mind the national security issues are over in the Middle East today. And this money could be better spent doing other things and not adversely effecting our fish and wildlife. Thank you.

And I just want to say thank you for doing this EIS. I understand that you haven't necessarily been doing them regularly over the past few years. So, I appreciate that you are coming here and asking us for our comments. Thanks.

MR. MICHAELSON: Any one else who heard those comments, has inspired to add their own to those?

MS. ROESBERY: I would like to.

MR. MICHAELSON: Sure, go a head. We'll just have you fill out this card afterwards.

MS. ROESBERY: Thank you.

MR. MICHAELSON: Go a head. All I need is your name.

MS. ROESBERY: I'm taking off my radio hat now and I'm speaking for myself.

MR. MICHAELSON: Okay.

CAROLYN ROESBERY

Commented as follows:

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peoples livelihoods depend on the halibut too.

So, that's just what I think. And it takes 25 years to -- for a halibut to get to 100 pounds, so -- and after that they're growth slows even more. So, if one of the ships hits a 600 pound halibut that would take 100's of years to replace. So, thanks for your time.

MR. MICHAELSON: Thank you. And if you need anyone to sign anything for your merit badge, you let us know, okay? All right, thanks. Thanks for speaking. Anyone else? If not this would be a time that if anyone who already spoke would like to add to their comments, then please feel free to come up here and do that.

No one actually used up their whole three minutes. I didn't feel anybody ran out of time. Let me look at my watch here real quick. It's now 8:20, so I'm going to recess again, and we're going to go next door again. And my guess is unless somebody else comes forward that's how we'll wrap things up tonight. So, thank you very, very much again for coming tonight. We appreciate you taking the time and energy, and the courage for some of you to come up here and do this. We know that's difficult. Thank you very much.

(Recess)

DANIELLE BENNETT

Commented as follows:

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My name is Carolyn Roesbery. Any other information? Okay. I'm not convinced that activities -- Naval activities in the Gulf of Alaska won't contribute to the decimation of our fishery. We have one of the last wild salmon fisheries in the world. We have very rich, diverse environment. It is one of the biggest fresh water influxes in the world, here in Prince William Sound.

We're just now finding out what our fish are doing when they're not in the spawning and where they're going. We just now have the technology and are researching that. And it is out there where you intend to be. And I'm not convinced that -- that you have all the science that you need. You may have acquired all the available science that is assessable to you, but I think you need to go further. I think it's very, very important. Thank you.

MR. MICHAELSON: Anyone else? Sure, go a head.

KRIS RANNEY

Commented as follows:

I'm Kris Ranney, I'm in the Boy Scout Troop 624. And just to add on to what she just said. There's another species of fish that lives out there, the halibut. Most of them move in in the summer to shallow waters, but some of the bigger fish stay out in the deep water. So, when you are bombing those boats and sinking them, and some of the bombs and guns might disrupt their habitat. And a lot of

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Okay. My name is Danielle Bennett and I'm a resident of Cordova. From my perspective Alaska has one of the few functioning fisheries left in the world. From what I've seen of the EIS, the impact has been minimized to individuals, but many individual impacts amount to a cumulative negative effect.

We know for a fact that SONAR does have a negative impact. And that is reason enough to not expand the activities, as far as I'm concerned. What concerns me even more, however is -- are the things that we don't know. There are a number of uncertain statements. Anticipated effects, possible outcomes that are indicated. This ecosystem is important enough that those things should be addressed first before we have negative impacts that we don't even anticipate.

Please find another habitat or an already dead zone in which to operate. Historically speaking, this region has little reason to trust in regulation. When I think of national security, I see protecting whatever is left of functioning ecosystems as of the most vital importance. I recommend proceeding with the no action alternative or reduce activity all together. Thank you.

MR. MICHAELSON: This is Lewis Michaelson, it is now 8:30 p.m. in Cordova. We have no more speakers this evening, so we are going to officially adjourn this

meeting.

(Meeting adjourned)

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TRANSCRIBER'S CERTIFICATE

I, CLYDE PASTERSKI, hereby certify that the foregoing pages numbered 4 through 31 are a true, accurate, and complete transcript of Hearings held in Cordova, Alaska on the Gulf of Alaska Navy Training Activities Draft Environmental Impact Statement/Overseas Environmental Impact Statement transcribed by me from a copy of the electronic sound recording to the best of my knowledge and ability.

_____

Date Clyde Pasterski, Transcriber

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I.8 ORAL COMMENTS AND RESPONSE TABLES

I.8.1 KODIAK

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
Kodiak			
Carolyn Heitman 1-1		My name is Carolyn Heitman. Is that good? [MR. MICHAELSON: Yeah.] Okay. One of the things that was confusing to me and one of the gentlemen cleared up for me earlier was on -- let me find the page here. On page 2-4 of the draft it showed the whole Island of Kodiak in red, which was enclosed within the restricted area, and that was a little bit confusing to me. Because I do know a couple years ago the FAA did enforce restricted air space over parts of Kodiak Island which included our airport. And -- so anyway he cleared up and we looked in the book and he it -- on your map over there it's not on the map, but he said it was a misprint and then at final he was going to make sure that it was in black. So, if I understand Kodiak is not included in restricted area as Fort Richardson.	The red box in question was intended to be a map insert, which is a standard way of identifying a specific geographic region that is being discussed. All "map insets" including the one you specifically referenced (Figure 2-2) has been re-colored to avoid any confusion.
Carolyn Heitman 1-2		Okay. And, let's see here -- and one of the things I had requested in my comments is a boundary line in the training area covers the Aleutian Trench and I had requested that the Navy list what types of exercises would take place in the trench, what type of SONAR and the effects that it -- the impacts it would have to the sea life that lives within the trench, and I didn't see that addressed.	Activities proposed within the TMAA have the potential to occur over the Aleutian Trench. Sound energy from sonar may be present within the trench on occasion. However, the probability of effect is uniform across the entire TMAA. The potential effects to resources are analyzed as a whole and effects to the trench are reflected in potential effects to the entire TMAA. Additionally, as provided in Section 5, mitigation measures will be implemented as appropriate whenever marine mammals are detected. In this manner, the Navy mitigation measures will afford all areas the same least practicable adverse impact.
Carolyn Heitman 1-3		And it states here that the Gulf -- the Gulf of Alaska draft states that the Navy does not know what the environmental damage or harm would be to birds from midfrequency at long range, and I'd like to see that addressed.	As stated in Section 3.9; Birds: "NMFS issued an environmental assessment with regards to the harassment of marine mammals in 2003 in accordance with the Marine Mammal Protection Act of 1972 (MMPA). As part of the environmental documentation, birds were analyzed for potential effects associated with exposure to active sonar. The potential hearing capability of birds was outside the proposed high frequency of the operating system and there is no evidence that birds utilize sound underwater to forage or locate prey. Thus, it was concluded that effects were unlikely. In addition, birds would not be an effective receptor because they are submerged only for short periods and birds at the surface can rapidly fly away from disturbance and annoying sounds."

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
Kodiak			
			Please see section 3.9.1.1 of the FEIS/OEIS for NMFS 2003 reference regarding effects of sonar on birds.
Carolyn Heitman 1-4		No detailed information on how the Navy exercises will impact fisherman. Whether or not, you know they'll be restricted. I understand if you go by -- one of the choices was that there would be two 21 day training periods rather than just one, if that one was chosen. So, I'd like to see more emphasis on how it would affect the livelihood of fisherman.	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. The Final EIS/OEIS describes potential economic impacts to fishing in Section 3.12.2.5. In this section, the analysis concluded that impacts would not be significant due to advanced public notification and primarily short-term duration of military activities. Analysis of impacts to fish is found in the Final EIS/OEIS in Section 3.6. It should be noted that the Navy has no exclusive "right of way" when conducting training activities on the ocean. Navy ships and aircraft intentionally seek areas clear of all other vessel traffic, thereby reducing the likelihood of negatively affecting fishing and tourism industries. Additionally, no new closure or restricted areas are proposed. To help manage competing demands and maintain public access in the GOA, the Navy conducts its offshore activities in a manner that minimizes limitations to recreation and commercial activities. Because of the analysis, the Navy is confident that its training activities will not impact fisheries, fish populations, or the livelihood of fisherman off the Gulf of Alaska.
Carolyn Heitman 1-5		Also, it's -- okay, let me find it here. On section 3.14, on public safety you say there would be no public safety issues. In that section though under public safety it says, activities that could affect public safety include electromagnetic energy, but no details were given concerning that.	As stated in Section 3.14; Public Health and Safety, Electronic Warfare (EW) systems emit electromagnetic radiation (EMR) similar to that from cell phones, hand-held radios, commercial radio, and television stations. Navy standard operating procedures are in place to protect Navy personnel and the public and include setting the heights and angles of EMR transmission to avoid direct exposure, posting warning signs, establishing safe operating levels, and activating warning lights when radar systems are operational. To avoid excessive exposures from EMR, military aircraft operate in accordance with standard procedures that establish minimum separation distances between EMR emitters and people, ordnance, and fuels.
Carolyn Heitman 1-6		And I would also like to know -- when you did the EIS for Hawaii uranium and red and white phosphorus was used in the training exercises. I would like to know if that will be used in the Gulf of Alaska.	Depleted Uranium (DU) is not part of the proposed action for this EIS/OEIS. In February 2009, Commander Pacific Fleet directed that all Pacific Fleet ships offload all depleted uranium rounds at the earliest opportunity. This change is reflected in the EIS/OEIS in Section 3.2.1.1. White phosphorous is listed in Section 3.2.1.1 as a possible constituent of general pyrotechnic materials, but is not a

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
Kodiak			
			constituent in training materials proposed for use in the Gulf of Alaska TMAA. Red phosphorous is a compound contained in the MK-58 marine marker. Please see Section 3.2.4.4 under "Targets and Pyrotechnics" for analysis of environmental fate of red phosphorus.
Carolyn Heitman 1-7		And, let's see, and although you mentioned new proposed weapons systems, you didn't identify them.	In Section 2.5.3 of the Draft and Final EIS/OEIS the Navy has included discussion of new platforms and equipment that have not yet become operational in the Fleet. Several future platforms and weapon systems have been identified that are in development, and are likely to be incorporated into Navy training requirements within the next 10 years. These include new ships, submarines, aircraft and new weapon systems such as the Advanced Extended Echo Ranging Sonobuoy, and new training instrumentation such as a Portable Undersea Tracking Range. Several of these new technologies are in early stages of development, and thus specific concepts of operations, operating parameters, or training requirements are not yet available.
Carolyn Heitman 1-8		I'd also requested that the Navy fund our electromagnetic radar system here and -- through the University of Alaska and it's classified as an electromagnetic warfare systems radar that the Navy could use. So, I would like to see that addressed if it will be used.	The electromagnetic radar system at Kodiak is not part of the Proposed Action.
David Kubiak		Yeah, thank you ladies and gentlemen for the opportunity to address this EIS -- the draft EIS. And I appreciate you coming to Kodiak. I -- with 18 days left, I'm the Chairman of the Alaska Marine Conservation Council. So, I'm here sort of on duty, like you are. With only 18 days left to comment, if the January 25th deadline is to be kept, I've got slow upload for my computer. I guess might be able to leave it on all night and download your EIS on the computer. But 25 megabytes at 56K takes a long time. And I think I have a obligation since I don't have the information really here to review, I think it would be a mis-step and be irresponsible for me to make a pointed comments about that impact statement. I did though hear Carol say that -- and it reminded me that if we have 21 days -- two periods of 21 days, basically six weeks of training exercises, and they're up on the edge of the Gulf there, that's prime fishing bottom. And that's a huge chunk of time out of a commercial	Please note that long-range advance notice of scheduled activities and times will be made available to the public and the commercial fishing industry via the Internet. The local 17th District U.S. Coast Guard Notices to Mariners may be found at: http://www.navcen.uscg.gov/Inm/d17/. This site provides the public notice that the military will be operating in a specific area and will allow you to plan activities accordingly to avoid potential conflicts. The training events will not preclude fishermen from using any portion of the Gulf of Alaska.

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
		Kodiak	
		fisherman's opportunity especially -- I'm a halibut fisherman and that would be a huge chunk of time out of the halibut season. I don't myself go there, I've got a small boat. But I know the more nautical fellows are out there all the time and that's prime halibut bottom. So that's a huge -- a huge divot in their -- in their season, 21 days times two. But other than that I just want to say, I appreciate you coming here and I'll look forward to reading the EIS completely. But that really -- that 18 days left to comment, wow, that's going to be very difficult. Thank you.	
Katherine Ellanak 1-1		Good evening, my name is Katherine Ellanak. I'm with the Sun'aq Tribe Environmental and Natural Resource Director here in Kodiak. And although your EIS came in -- sent out dated December 2, we only received the EIS last week. And this January 25 deadline is not fair. There are other deadlines that we need to work with here in Kodiak.	The Draft EIS/OEIS was sent via Federal Express to the Sun'aq Tribe on Dec 9th 2009, and delivery records from Federal Express indicate that it was delivered on Dec 11th, 2009 at 1:02 pm and was signed for by P. Hester.
Katherine Ellanak 1-2		But out of respect for this time, and consideration for the fisherman, and the sea life whatever's happening there -- I saw -- I skimmed through that and there are a lot of fish in that area that you want to be training in. And that is not only affecting Kodiak fisherman and subsistence and sports. It goes all the way through the coast of Alaska up to my people in the Bering Sea areas.	There are no proposed activities taking place in the Bering Sea. All training activities at sea will take place in the Temporary Maritime Activities Area as depicted on Figure ES-1. The proposed training activities should not have an impact on populations of fish. While individual fish may be harmed if they co-occur with some activities that use explosives, this should not have any impact on the overall population. Please see Section 3.6.2 for potential impact discussion for Fish.
Katherine Ellanak 1-3		And the seals -- we don't know how nomadic our animals are from the sea, the (indiscernible) and the fish, and the whales, the seals, the birds -- they have no boundaries. Even if you make a boundary there they're going to be coming in and out of there.	As presented in Section 3.8, the Navy is aware of the presence and movement of animals in the proposed training area. Specifically regarding seals, Section 3.8.2.1 describes the means by which Navy derived marine mammal (including seal) densities for calculation of potential impacts.
Katherine Ellanak 1-4		And the fish, the sea's abundance, it's crucial right now because fishing is very critical right now. It's starting to be hard to be a fisherman anymore because of the prices. And we know nationwide that Alaska fish is like gold for anywhere in the world.	This comment is duly noted. The proposed training activities should not have an impact on populations of fish. While individual fish may be harmed if they co-occur with some activities that use explosives, this should not have any impact on the overall population. Please see Section 3.6.2 for potential impact discussion for Fish.
Katherine Ellanak 1-5		The other thing is when you guys do that April to October, 21 days, that's crucial time also for anything, fishing and the rearing of the babies from the seas.	In Section 2.3.2.3 of the Draft EIS/OEIS, the alternative of training during alternate time frames in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
Kodiak			
Katherine Ellanak 1-6		And the amount of lead, cadmium, and everything else is going to be used and exposing to our seas is detrimental.	The Final EIS/OEIS thoroughly analyzes the impacts of expended materials used during Navy training activities. As shown in Table 3.2-18 and 3.2-19, an estimated 352,000 lb (176 tons) of material would be expended during the training activities proposed under Alternative 2, with less than 3 percent of that material (about 5 tons) considered to be hazardous. Section 3.2 of the EIS/OEIS describes the impacts from the perspective of potentially hazardous materials such as explosives constituents. Section 3.3 describes the impacts of expended materials in terms of water and sediment quality. In addition, the existing discussion on the breakdown of hazardous materials in Environmental Consequences of Section 3.2.2, Expended Materials has been reviewed and, as appropriate, expanded. The analysis in the EIS/OEIS concludes that Expended and hazardous materials under the Proposed Action would not have a substantial effect on the marine environment.
Katherine Ellanak 1-7		And I just would like to see that you guys can extend this January 25 deadline into something more appropriate for us to really review the EIS document. And we had a meeting yesterday with our tribe and it's -- you know, like I said, we just received that EIS last week and today's Thursday. And then there's no time for me and my Environmental Committee to meet with the Tribal Council and have a good meeting about this. Quyana.	Public comments are very important to the NEPA process. The Draft EIS/OEIS was released to the public for a 45-day comment period. During this 45-day period, the Navy made extensive efforts to conduct outreach based on what was learned during the scoping period and public feedback. There were ample opportunities, as well as a wide variety of options, to comment on the Gulf of Alaska Draft EIS/OEIS. The public provided comments via mail, online comments via the Gulf of Alaska EIS/OEIS website; or attendance at one of five public hearings in the state of Alaska in January 2010. At the public meetings, the public had an opportunity to publicly or privately comment in front of a court reporter or fill out a comment form, and turn it in. The Navy considered your request for an extension of the 45-day comment period. After further evaluation of the request, and the outreach efforts conducted by the Navy for the Draft EIS/OEIS, the Navy felt it was not necessary to extend the public comment period for review of the Draft EIS/OEIS.
Theresa Peterson 1-1		Good evening and thank you for coming to Kodiak and giving us the opportunity to talk about this proposed action off our island home here. My name is Theresa Peterson. I'm a member of a long time fishing family and I work with Alaska Marine Conservation Council. The Alaska Marine Conservation Council is a community based organization	Please note that as presented in Section 4.8.3, there are many sources of human generated noise in the Gulf of Alaska for which the proposed Navy training would only be a small and transitory contribution. Also be aware that sonar use outside the Navy is common in the Gulf of Alaska including, for example, fathometers, fish-finders, and NOAA research

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
Kodiak			
		dedicated to protect the integrity of Alaska's marine ecosystem. And AMCC is concerned about the potential increases in Navy training activities in the Gulf of Alaska. Particularly of concern are the effects of underwater noise on living marine resources, especially noise resulting from the use of SONAR in this productive and important marine environment. We support the no action alternative, which would maintain current training activities and does not involve the use of SONAR. The alternatives listed in the analysis are inadequate to explore a range of options to consider anything else at this juncture. Overall the proposed action would result in dramatic changes in the acoustic marine environment inside and adjacent to the operating area that could have significant impacts on the marine mammals inhabiting these waters. Critical habitat for the North Pacific right whale, the worlds most endangered whale is located directly adjacent to the training area.	involving acoustic trawl surveys for fishery resources. In Navy training ranges in Southern California, Hawaii, and the East Coast where training involving sonar use has been occurring for decades, there are no indications of impacts to the marine environment and these areas support healthy fisheries and abundant marine mammal populations. Please also note that the designated right whale Critical Habitat is not directly adjacent to the training area, but is in fact located 16 nautical miles from the corner of the training area.
Theresa Peterson 1-2		The draft EIS is lacking a robust analysis regarding potential impacts to the halibut and the halibut fishery. It includes no discussion or maps showing the major halibut regulatory area that directly overlaps the training area. Nor does it discuss halibut habitat in the area. This information needs to be added.	As detailed in Section 3.6, the Navy does not believe the proposed activities will have any impact on populations of fish or any fishery in the Gulf of Alaska. Regarding the newly established charter fishing regulatory area for halibut, since the Navy is not engaged in sport charter fishing, the regulatory area does not apply to Navy. The regulatory areas were established because (according to NOAA Fisheries), charter halibut fishing in the Gulf of Alaska has been growing steadily and exceeding harvest levels set to protect halibut. Charter halibut businesses have to obtain a permit from NOAA (planned to begin as of early February 2010) to be able to have clients legally catching halibut in the Gulf of Alaska (see http://www.fakr.noaa.gov/newsreleases/2010/charterhalibut010410.htm). A map showing the Sport Charter Halibut Fishing Regulatory Area was reviewed but was not added. The TMAA overlaps with International Pacific Halibut Commission statistical areas 240, 250, 260, 270, and a small portion of 230. Please note that a map showing this overlap, as well as an analysis to halibut and the fishery, has been added to the FEIS/OEIS in Section 3.6.1.1.
Theresa Peterson 1-3		The draft EIS does not include an adequate discussion of salmon migratory routes in the Gulf of Alaska, and therefore lacks a robust analysis of impacts to migrating salmon species in the region.	Life history information, including migratory routes, for salmon are discussed in Section 3.6.1.3. While studies have indicated that the TMAA is part of the migratory route for some salmon species, the details are still lacking. Given the relatively short

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
Kodiak			
			duration of Navy activities, over a relatively small area, there is a low probability of Navy activities coinciding with migration of salmon species (described in Section 3.6.1 3). The ocean migrations of salmonids was defined by Pearcy (1992) as 1) the coastal phase of juveniles, 2) the oceanic feeding phase, 3) the return of maturing fish from oceanic to coastal waters, and 4) coastal migrations of adults that terminate in freshwater. The distance traveled and the time spent in each of these phases vary greatly within and among species. Pacific salmon smolts generally move up and around the West Coast of North America following the continental shelf. Juveniles were found to remain over the continental shelf until the start of the Aleutians before moving offshore. The Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential effects given the best available scientific data in Chapter 3 of the Final EIS/OEIS.
Theresa Peterson 1-4		There is not a thorough assessment of the overlap with fishing areas, and the conclusion that there will be no socioeconomic impacts from the proposed action, including fishing is impossible to predict without comprehensive answers to the above mentioned comments.	As detailed in Sections 3.6 and 3.12.2.3, the proposed training activities should not have an impact on populations of fish or the health of the fisheries and socioeconomics in Alaska. Also see Section 4.1.2.1 regarding cumulative impacts to fishing.
Theresa Peterson 1-5		It is probable that the Navy under estimates the number of marine mammals and fish that will be harassed, injured, and killed because it simply does not have the density estimates needed in order to accurately make this determination. There is no reliable estimates for current or historical abundance numbers for many of the affected marine mammals in the Gulf of Alaska.	Section 3.8.2 in the FEIS/OEIS discusses the density estimates, as well as Appendix E. In April 2009, the Navy funded and NMFS conducted the Gulf of Alaska Line-Transect Survey (GOALS) to address the data needs for density analysis (Rone et al. 2009). Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. Please see Section 3.8.2.1 for full discussion on the survey. Based on the current approved acoustic impact modeling, the density estimation method, not reducing impacts as a result of mitigation, and previous determinations by National Marine Fisheries Service, it is more likely Navy actually overestimates impacts to marine mammals with these estimates.
Theresa Peterson 1-6		And finally, I know firsthand there are not adequate measures to mitigate the harmful affects of SONAR. The proposed mitigation measures are basically safety zones. And from what I'm understanding, visual sighting of whales. And having fished in that area for over 25 years and having	As detailed in Chapter 5 of the FEIS/OEIS, the mitigation measures involve much more than a sonar "safety zone", making use of all available observers such as those in aircraft in addition to observers on vessels, and use all available sensors such as passive acoustic hydrophones. The mitigation

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
		Kodiak	
		spent sometimes days looking for a buoy in the adverse weather conditions that we have out in the Gulf of Alaska, probably 80 or 90 percent of the time. I do not have confidence that visual sightings is an adequate mitigating measure.	measures presented in the EIS/OEIS were developed in coordination with NMFS biologists and scientists to determine which mitigation measures would be both effective and still allow the Navy to meet the operational needs for realistic training. The Navy's mitigation measures are designed to minimize impacts. It is recognized that not all marine mammals will be present at the surface and/or detected visually and not all marine mammals will be vocalizing and thus detectable by passive acoustics. The mitigation measures are effective at limiting some marine mammals exposures to high levels of sound in close proximity to the source, just as they were designed to do. Please note that Naval vessels have a higher height of eye than most fishing vessels as well as having multiple vessels over a very wide area, communicated sharing of observations, and operating in a coordinated manner in combination with aircraft that are also observing the water space. The Navy does not expect 100% of the animals present in the vicinity of training events will be detected and the acoustic impact modeling quantification is not reduced as a result of mitigation effectiveness. However, mitigation measures based on detection of marine mammals by exercise participants anywhere in the exercise area will result in the mitigation of some potential impacts. Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. As part of the Integrated Comprehensive Monitoring Program, research to measure the ability of Navy observers to detect marine mammals is also underway.
Theresa Peterson 1-7		And finally in closing, I would very much suggest that you extend the comment period an additional 45 days in order to allow people adequate time. And again, thank you for coming.	Please see response to Katherine Ellanak 1-7.
Amanda Barnette		My name is Amanda Barnette. I'd also like to thank you for coming to Kodiak and listening to our comments. I think the Navy should establish minimum visibility requirements while training, especially while training with active SONAR, so that the lookouts may identify marine mammals in the immediate area. Thanks.	Please see response to Theresa Peterson 1-6
Katherine		Katherine Ellanak with the Sun'aq Tribe of Kodiak. The other	This comment is duly noted. Please note that the Exxon

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
		Kodiak	
Ellanak 2-1		thing is we already have visual and historical history about what Exxon oil spill did. And it shows what the current is going to be like. And the red tide that happens and years of evolutionary natural disasters that there used to be abundance of fish here of all kinds. But after the '64 earthquake, right over there in Yuzhni where there used to be herring and everything else. The fish that used to be there are no longer there and the fish that we have presently here are in danger of other disasters that are going on. And you know, Bligh Reef is hit again and even the Arctic Slope with the BP having their pipeline problems, I mean even if it's far and beyond us, it's helping to come down here from the pipeline. And things of that kind of disaster, we need to consider those before the fish is going to be depleted.	Valdez oil spill was addressed within the affected environmental baseline descriptions for the GOA area.
Katherine Ellanak 2-2		It's -- I cannot name and I'm not a scientist to see when I was scanning through the EIS -- it's unfathomable to me to try to determine what all else is going to be affected by all the chemicals and toxins and hazardous materials that are going to be expended into the sea.	Please refer to your previous comment and response in Katherine Ellanak 1-6.
Carolyn Heitman 2		I'm sorry, it's Carolyn Heitman. When the Navy did the Environmental Impact Statement for Hawaii, the west coast, Gulf of Mexico, and the entire east coast of the United States they got a permit from NOAA to -- and this is something that I had mentioned in my comments in a -- the last time. They got a permit from NOAA to incidently take two million marine mammals per year for the next five years. And I would like to have you include in the final if that permit will extend to the Gulf of Alaska. And if not will you be requesting a new permit for incidental takes and for how many marine mammals?	Sections 3.8.7.7, 3.8.7.8, and 3.8.7.9 describe the number of estimated takes by species for each of the alternatives. The Navy has requested a Letter of Authorization permit from NOAA for training activities in the TMAA based on the estimated take of marine mammals under the Preferred Alternative; the permit will be specific to the proposed actions in the Gulf of Alaska. Please note that of the approximately 425,000 exposures under the Preferred Alternative, which are estimated without consideration of the Navy's protective measures, only **one** is expected to be a Level A harassment. The remainder are non-injurious Level B exposures. No marine mammal deaths are expected as a result of the proposed training activities.
Theresa Peterson 2-1		Thank you. Theresa Peterson again. I have two brief comments. In reflecting on what Katherine was saying, I feel strongly that we have a lot of unknowns that are approaching our waters in the Gulf of Alaska and this northern climate -- and worldwide, in particular the ocean acidification and the changing ocean environment.	Ocean acidification and climate change, as they apply to GOA, are addressed in Section 4.2.1.2 of the FEIS.
Theresa Peterson 2-2		But also in reflecting about commercial fishing off of that edge which has been -- like I said, I've spend decades out there doing that. And I've noticed a change in the whales	This comment is duly noted.

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		Kodiak	
		habits when you're long lining halibut and primarily black cod. The sperm whales and the killer whales -- we're kind of like dinner bells out there. They recognize a boat out on the edge, they hear you. You turn on the hydraulics, they come charging up to the boat. The whales in the Gulf just -- primarily over these last 10 years are getting habituated to associating the sound of a fishing vessel to a feeding opportunity. And so in thinking about this, when there's Navy operations going on and the other boats have been requested to leave the area, I would think there's going to be a natural tendency for the boat -- the whales to actually approach a vessel and explore to see what they're doing. Because they have been doing that. And I just wanted to share that thought. Thank you.	
Richard Courtney		My name is Richard Courtney and I'm here representing myself. I'm also representing myself as a 20 year Navy veteran. I served on two aircraft carriers, a helicopter carrier, and a -- one of those large ones that you see right over there. I've ridden smaller destroyers and LST's. I find it absolutely critical for the U.S. Navy to practice in an area such as the Gulf of Alaska. I am an expert on meteorology and oceanography. I'm also an expert on the American sailor running around on a ship. And if you haven't figured it out, I'm still a little nervous here. One of the things we don't recognize very much is what it is to be out there on a ship doing the good deed, that's defending your nation. You cannot go down to Hawaii in the middle of the summertime, run through a five to an eight foot sea state with a 20 knot trade wind and say, hey I know what it's going to be like to be up here in the Gulf of Alaska. It's a different environment. You walk out through your front door, you put a coat on, you put a hat on. You don't run out there bare chested in Kodiak in January. So it's absolutely necessary for us to understand that we have to work in other environments. That's what this is all about. Now back when I was in they didn't have these, or they were greatly reduced. And this is a great thing, it's an honest effort to try and make sure we don't screw something up. But bare in mind that the United States Navy has been around 200 -- more than 200 years actually. We still have fish out there, we still have whales. I have not in the time I road on aircraft carriers, looking for submarines -- yes, I did that. I didn't see any dead whales wash up behind	This comment is duly noted.

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		Kodiak	
		my ship. I never saw the Navy go out of it's way to try and hurt anything in the ocean. They are very, very studious about watching out for things. I was directly involved in that. I'm not here because I think I owe the Navy something. I'm hear about my own personal interest. I'm not here for every man and woman that is out there on a ship right now that does not know what it's like to get beat up out there. All of you that claim that you've got fishing boats out there, would you take a nice 23 foot skiff and go running through the Bering Sea this time of the year, to go from St. Paul to Dutch Harbor? No, you wouldn't. You'd pick the biggest boat that you can, they one that rides the best and most comfortable. And that's what we're doing with ships. We're training people how to survive an environment. And there's only one way to do that, there's only on way to survive combat. Train like you fight and fight like you train. That comes right out of the Navy. Thank you for putting up with me.	
Geneneiea Pearson 1		My name is Geneneiea Pearson. I've lived in Kodiak since 1941 and have observed the whales since that time. But what I'd like to say is, that I'm disappointed in this meeting in that you did not have an open meeting so that we could hear your answers to questions. I think that would have been helpful and we could hear what -- other peoples concerns are more than just these comments. Because a lot of people are shy about talking, like me.	From past experience, the Navy has concluded that the public hearing format used during the public hearings is the most conducive to effective dialogue. Additionally, all five public hearings held in Alaska exceeded NEPA requirements. Adequate time was given during the open house portion of each meeting to ask questions of a number of subject matter experts.
Geneneiea Pearson 2		The other suggestion I would like to make is that you have a civilian observer, maybe one or two on each of these carriers to observe for the public as to what goes on. So that there's an honest assessment of what happens. If you can come up with something out there, I know it's hard because of the ocean, you can't really tell what's going on.	Please refer to Sections 5.2.1.3 and 5.2.1.4 regarding monitoring during training events to help determine if there are any unforeseen impacts resulting from Navy training activities.
Geneneiea Pearson 3		But I'm very concerned for the fisherman that are being replace -- displaced during the period that the exercises will be taking place.	Because the Navy has no exclusive “right of way” when conducting training activities on the ocean, Navy ships and aircraft intentionally seek areas clear of all other vessel traffic, thereby reducing the likelihood of negatively affecting fishing and tourism industries. In addition, long-range advance notice of scheduled activities and times will be made available to the public and the commercial fishing industry via the Internet. The local 17th District U.S. Coast Guard Notices to Mariners may be found at: http://www.navcen.uscg.gov/lnm/d17/. This site provides the public notice that the military will be operating in a

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			specific area and will allow you to plan activities accordingly to avoid potential conflicts. The training events will not preclude fishermen from using any portion of the Gulf of Alaska. Please see Chapter 3, Section 3.14 of the Final EIS/OEIS for the description and analysis and potential effects.
Geneneiea Pearson 4		And I'm very concerned for the marine mammals that will be out there and will be attracted to the boats. Because I know the whales now a days come up to the boats. I have fished myself for many, many years. I know that they're trusting us now, which they didn't used to during the years ago. When they were slaughtering them out here, when the Russians were right off shore out here, slaughtering whales. We could see the fleet at night, I looked like a city out there. But I know that at -- after that slaughter was over the whales were very skiddiest. If they saw us they were gone. We only saw then once. Whereas now they aren't afraid of boats and they come right up to the boats sometimes. So I'm very concerned about this whole process and I wish the Navy figure out another way of working their ideas out for antisubmarine warfare. I wish they would go somewhere else to do it. Thank you.	Please see Chapters 1 and 2 regarding the purpose and need for anti-submarine training in the Gulf of Alaska.

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		Kodiak	
Richard Courtney 2		Hi, this is Richard Courtney. I live in Kodiak, Alaska. I'd also like to add on to my statement that I made earlier. And one of the biggest reasons I feel it's critical to come up here and learn, as a sailor is exposure to the harsh weather conditions that are up here. At one point in my Navy career, I was up off the coast of Norway and I had 70 knots of wind and 35 foot seas. There was millions of dollars of damage done to five amphibious warfare ships and a destroyer. We had no exposure up there and very few people ever got a chance to work up there. And by learning to come up here and work in these harsher conditions, you have a better understanding of what it takes to survive. Especially in a combat situation. You don't have to look back any farther than World War II, and look at some of the actions of what ships had gone through and how much better they would have been prepared if they actually practiced in foul weather instead of practicing in the calm waters off of Hawaii. So that's why I think it's critical to come up here. I don't expect a complete understanding of everything, but I think it's real critical for the military to come to work as a team up in rough weather. And that's about -- basically all I've got to say.	This comment is duly noted.

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I.8.2 ANCHORAGE

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Paul Kendall 1-1		My name is Paul, middle initial D, Kendall. I'm an Anchorage, Alaska citizen. And I just came in for the first time to see what you had. It's my first time to be at one of these and I found it to be efficient, professional, entertaining, and amenable. And all you people have been very congenial and professional. Because you're in what they call the Gulf of Alaska up around Cordova, Kodiak and the entry to Cook Inlet, I'd really like to see you bring some type of studies on the tidal. I think it's a high tidal area and there are only so many tidal areas around the world. And I'm of particular interest between Cordova and the Cook Inlet. And when I look at the resources that you're going to bring into the inlet like that, the ships and all of those monitoring devices. I'd like to have you make your data available to the local communities in the event that they move to some type of tidal generation for energy for our residential sectors. And when you consider the fact that a pound of water weights about 62 [sic] pounds, and you put that into a ten foot by ten foot by ten foot cube, which is equal to something along the lines of a UPS delivery van. That content of that van equals about 31 tons or 62,000 pounds. And if you were to bring that poundage on board a ship, in essence you could use that weight on just one van, which is a ten by ten by ten cube of water. You could use that as a counter weight to move down to push gears. And then if you release that water you can actually have crawler or water wheel turn to make electricity as you move the water out. And as you move that water out back into the ocean through a pipe, what will happen is you can displace the air that's in the pipe, and that air will push turbines. And if you close off the back of that pipe as you release the water from the front end of it, you can also as the water runs out it draws the air the other way into a vacuum and those air reversals will turn turbines. So, you in essence have a ship that can generate energy onboard, especially with the tides. And when you begin to look at those ten foot cubic capacities of movement in tide, the numbers are huge and astronomical. So, if you're going to come into an area like that, around Cordova and Kodiak and the Cook Inlet, I would think that there would be some type of a participation. And I think they're getting	The proposed area where the training will occur will not include any of Cook Inlet and the nearest portion of the Temporary Maritime Activities Area (TMAA) is over 25 nautical miles from Cook Inlet. Please see Figure ES-1 in the Final EIS/OEIS for the location of the TMAA. Additionally, no tidal energy projects are considered as part of the proposed action.

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		ready to start the meeting, so I think I'm going to -- no. So, what I'm saying, when I look at the resources and the competency of your people who come into this area, I think you could bring to the people maybe a ship. And you could bring that in -- into the communities of Kodiak and Cordova and Seward, and maybe bring us a couple of extra ships and we could use those ships as power plants and the community could learn about waves and tidal capacity for generating electricity, which is clearly our next future. Other than that I think that's about it.	
Paul Kendall 1-2		Except well there's one more thing. I do think you should have a video webcam here. And that this gentleman which is -- gosh, I have to get my glasses -- the gentleman who's taking this testimony, Clyde E. Pasterski, I think you should furnish him with the money to have a webcam. And the way that should be done is that an individual should be escorted over here and asked if they'd like to make a video or a video and audio, or if they'd like to have a video from a distance and let them sit down and perhaps make their own little video. Because the writing is just too onerous. And I think that the children would like to do that. You get more involvement from the public and it's much more easy. And even if the communication were to go on at length, I think it could still be monitored and curtailed at appropriate times such as we have coming up now. Because I think they're getting ready to have a presentation. Thank you very much for what you're doing. And I love my America and I want it back the way old American values. Thank you.	This comment is duly noted. The Navy is in the process of developing a webcam feature for public hearings.
Wade Willis 1-1		Thank you very much and I appreciate -- first I want to say I appreciate very much the Navy coming up to Alaska and allowing us to speak. We're a State that is very supportive of the military and we are very appreciative of your coming up here to talk. My name is Wade Willis, I'm a biologist for the State. Been up here for 20 years. I have worked extensively in Prince William Sound and worked as a biologist in the Gulf of Alaska, so I know the country pretty well.	This comment is duly noted.
Wade Willis 1-2		Some of the concerns I have are that the operation area is being conducted in shallow areas and shallow shelf areas. And certainly those are areas that are very critical habitat for our resources -- our fisheries resources in Alaska.	Please see Section 3.6 with regard to an analysis of impacts to fish and fish habitat and Section 3.12.1.1 for an analysis of impacts to fishing. The Navy is aware of the importance of the fisheries at Portlock Bank and adjacent shallow water areas.

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Wade Willis 1-3		And I've very -- also very concerned that the operation area is in the middle of critical for migrating whales. I don't really know if it's an appropriate operation area for the military to be conducting more -- it's more aggressive SONAR operations. I would hope there would be areas of the country where we could identify for SONAR work that would not put such a risk to a lot of unknowns with our migrating whales. Several are endangered that move through this area. And using visual sightings of whales is notoriously quite you know, inaccurate. And a lot of the whales like blue whales can be underwater for very long extended periods of time.	Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. Chapter 5.0 of the EIS/OEIS, Mitigation Measures, presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. While the Navy is very confident in its well-trained lookouts, it does not expect that all animals present in the vicinity of training events will be detected. The acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided.
Wade Willis 1-4		So, I'm very, very concerned that the military is proposing 42 days in the summer. And as a guide I can tell you there's 90 days in the summer up there. And that's you know, about half of the summer you're proposing of possibility being out there conducting SONAR operations. That's a real concern of mine. I would hope that possible high use times for migrating whales could be avoided. And that possibility SONAR operations could be minimized as much as possible for the Alaska operation area due to the potential risk.	The Navy cares very much about the ocean environment, as it is an environment where we live and work as well. The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of operating sonar in the Pacific Ocean with no recorded evidence of harm to marine mammals, the Navy feels its protective measures are adequate. Please see Section 2.3.2.3 regarding a discussion for why an alternative time of year was rejected from further consideration.
Wade Willis 1-5		I'm also very concerned with the amount of toxins, the hazardous waste that's being proposed -- 10,300 pounds. I, particularly am very concerned with persistent organic pollutants which are really going through the roof in Alaska due to multiple sources. Our fisheries, our halibut, and long lived fishes like rockfish and lingcod are being limited in our ability to eat now because of persistent organic pollutants. And our marine mammals are showing extremely high levels of persistent organic pollutants. So, I wasn't able to figure out how much of the 10,300 pounds would be POP's, but I would encourage the Navy to try to mitigate any POP discharge. Thank you.	The Navy always strives to reduce any impacts to the environment when conducting operations. The only known source of key POPs (agreed to in the Stockholm Convention) from Navy training activities would be PCBs. Under the Proposed Action, PCBs would only be found in vessels used in a SINKEX event. Vessels are cleaned according to standards set by the U.S. Environmental Protection Agency to remove all PCB and other potentially problematic materials to the maximum extent practicable. Based on the 1999 SINKEX Letter of Agreement between the Navy and EPA, approximately 100 lb of PCBs are typically left on board each vessel used for SINKEX events. These PCBs are found in materials that cannot be removed without comprising the integrity of the vessel. Text describing removal of PCBs and other materials from SINKEX vessels has been added to

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			Section 3.2.2.2 of the Final EIS. Also, the estimated amount of PCBs (200 lb annually) has been included for the estimation of hazardous materials under Alternative 2 (Section 3.2.2.6).
Tom Lakosh 1		My name is Tom Lakosh, I'm an Anchorage -- Anchorage resident. But I've long been user of Prince William Sound resources and we appreciate your service, but find that some of the responses to my earlier inquires quite distressing. First of all with respect to mitigation methods, I fell it's wholly inappropriate to use the standard of impairment -- hearing impairment of whales as the necessary triggering standard for abating operations. Clearly the standard should be, and adverse behavioral impacts upon marine mammals and should be the standard to cease operations and for avoidance of those oper -- of those species.	As described in Chapter 5, the mitigation distances are based on more than the onset of hearing impairment. At approximately 1,000 yards from the most powerful surface ship sonar proposed for use (see Table 3.8-5), the received level of sound should not exceed approximately 175 dB (re 1 µPa) whereas the onset of the first measurable and temporary hearing impairment (TTS) has been established at 195 dB (re 1 µPa). This TTS threshold would likely not occur outside the 200 yard shut-down distance.
Tom Lakosh 2		And when I inquired as to why we wouldn't schedule the training sessions for periods outside the migration of whales, towards winter obviously. And outside of the migration paths, I was told that, oh well stuff breaks in Alaska winters. Well, we know that. We're out there, I've been a fisherman in the wintertime. You know, freezing spray, et cetera, et cetera. And if you guys don't want to build equipment to protect your 49th state, you might as well just take your stuff elsewhere. You know, bring up stuff that will work, do it in the wintertime outside of the migration seasons, and outside of their migration path.	In Section 2.3.2.3 of the Draft and Final EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Tom Lakosh 3		Establish a standard of avoidance of populations based on impacting behavioral standard of practices of the marine mammals. Set up a preliminary observations both with passive SONAR that is sensitive to the vocalizations of the whales, to find out where they are. Conduct your operations away from them to the greatest extent possible. We realize you need areas to train -- designated areas to train to keep out other commercial activities and vessels and so forth. But that area should be large enough so that you can avoid populations, take adequate time to you know, preliminary you know, pre-scanning of the areas where you plan to train and make concerted effort to avoid population densities to the greatest extend practicable.	Please see Section 5.2.1.6 which includes a discussion why the measures suggested in your comment were considered but eliminated from further consideration. In previous documents NMFS has indicated that seasonal or geographic limitations are a direct and effective means of reducing adverse impacts to marine mammals. However, the concept of geographical and seasonal (or temporal) limitations is inconsistent with the Title 10 responsibilities of Department of Defense to assure a fully trained and ready military force in regards to training activities in the GOA. Such restrictions would not be appropriate in the GOA. It is important that any measures are used carefully at times and places where their effects are relatively well known. For example, if there is credible evidence that concentrations of marine mammals are known to be high at a specific place or during a specific time of

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			the year, or that certain areas are selectively used for important life functions like breeding or feeding, then these types of seasonal or geographic exclusions or limitations can be effective. However, if marine mammals are only known to prefer certain types of areas (as opposed to specific areas) for certain functions (such as beaked whales use of seamounts or marine mammal use of productive areas like fronts), which means that they may or may not be present at any specific time, it may be less effective to require avoidance or limited use of that type of area all of the time. Additionally, as detailed in Section 5.2.16 of the EIS/OEIS, the mitigation measures involve much more than visual observers on ships, make use of those in aircraft, in addition to use of all available sensors such as passive acoustic hydrophones. The mitigation measures presented in the EIS/OEIS were developed in coordination with the National Marine Fisheries Service (NMFS) biologists and scientists to determine which mitigation measures would be both effective and still allows for the Navy to meet the operational needs for realistic training.
Tom Lakosh 4		One other method that is -- that Alaskan's have learned is that you can also call some of these species you know, particularly pilot whales and orcas to your presence by just fishing for black cod and halibut. So, you can call those species out of your test area by hiring a licensed commercial fisheries, ones that have had particular problems in the past, given that the marine -- the whales recognize their hydraulic sounds. And bring the whales out of harms way. Pay the fisherman to feed the whales while you happily ping away out in the Gulf. There are a number of methods here that you haven't fairly considered, you haven't done your job. You could do a better job, you could bring better equipment to operate outside of our peak summer migration and commercial fishing seasons.	As described in Chapter 2, the proposed activities are not a “test” and do not take place in a “test area”. As described in Section 5.2.1.6, it is not practical to clear the area where training will occur because Navy training activities are often not scripted and cover hundreds of square miles. In addition, the purposeful feeding of marine mammals would require authorization under the Marine Mammal Protection Act and in some cases, the Endangered Species Act as well, and these activities are not considered as a part of the proposed action due to these concerns.
Tom Lakosh 5		And you know, and a much less impact on our resources. You're here to protect us, not only our hides but our resources. When you talk about Alaskan's, our resources are apart of us. We live in subsistence, we live in tourism, we live in commercial fishing. That's our livelihoods, and that's why a lot of us come here to Alaska is to experience the wild, an undisturbed wild. And we don't need you know, disturbances that we clearly know are going to harm our	Socioeconomic impacts in regard to the fishing industry, tourism, and recreation have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics. To help manage competing demands and maintain public access in the GOA, the Navy conducts its offshore activities, which are limited in time and scope, in a manner that minimizes limitations to recreation and commercial activities. Furthermore, no closure or restricted areas are proposed associated with the Navy’s proposed

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		interests. We want you to protect us as whole people, not just part of us. And we want you to bring the proper equipment, make the proper preparations, and accordingly appreciate the resources and particularly marine mammals the way we do. Thank you for this opportunity.	action. Please note that there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment. As such, the Navy is confident in our analysis, the Final EIS, which concludes that there are no significant impacts to any resources from Navy activities.
Paul Kendall 2-1		My name is Paul, middle initial D, Kendall and I'm an energy activist. And as far as credentials go, I'm neither accomplished, degreed, or published. And I came here primarily out of curiosity and because of my -- I love the Navy, and I love the military, and our services and I think they're one of the few groups in our society that is being taught to represent us all as one society, America. But I'd like to make some suggestions to you. These will most likely be outside the scope of your EIS, but I'm really not sure what the scope is. In my world anything that contributes to a better society is a good thing and should be considered. So, I came here because I'd like to have you consider having some type of assigned energy -- an energy science technology officer, team, or department that travels with these fleets or groups of vessels. And I'd really like to see an actual vessel itself as designated as an energy science technology with each group of ships or vessels. And I'd like to see you gathering a tremendous amount of data in realtime, ice, tidal, temperature, wave, content, body contents, currents, et cetera. I just made a brief list of the things that you could do to contribute to our society. I think that you come to. I'd also like to see you, because you're in such a high tidal impact area, and there's so few tides I think around the world. I'd like to see you check your mothball fleet to see if you couldn't bring some type of a vessel to Homer, Kodiak, Seward, and Cordova. Something that has been mothballed that the community might be able to use. I'd like to see you come up in the winter so that we can get some ice data. And I'd like to see you -- let's see, consolidate your -- I forgot what that was about. My premise this, I'm convinced that we're going to be moving very, very quickly into water partnerships. And that there is no such thing as water ladies and gentleman. It's all hydrogen compounds, or contaminates, or particulates, or partnerships. And if I'm not wrong about this, we're about to see a whole new era of energy. And that energy is going to	This comment is duly noted. Please note that the Navy is engaged in numerous scientific endeavors and continues to make available to the public releasable information through papers, conferences, and manuscripts. Much of the Navy's research details can be found through the Office of Naval Research. However, your proposals are outside the scope of the Navy's proposed action of the GOA EIS/OEIS.

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		revolve around magnetic fields and the hydrogen atoms. And when I see these bodies, these vessels of tremendous capacity, intellectual and data rich with being able -- technology, with gathering -- data gathering rich devices, it would seem to me that it would be more interactive in those bodies of water for multiple reasons. I don't see how we could disconnect energy from anything. I have come to conclusion later in my life that most of the things you see are manifestations of energy. And our children within the next decade are about to learn that connectivity and with that comes responsibility for our balance and our in harmony. And that cast is huge, and the Navy has, I think has a fundamental fiduciary obligation to those creatures in that ocean and those communities along the way. And in closing, I'm coming to an end here, I'm opposed to the War in Iraq and I'd like to see all of my troop and all of my people come back to America and begin to rebuild our values that we all share in common and quality of lifestyles and family lives. Thank you.	
Wade Willis 2-1		Thank you again, my name is Wade Willis. And I want to impress upon the Navy the opportunity they have to help the scientific community acquire baseline data. It is a critical, critical component to our long term stability as a nation and as a State that we understand, as best as possible the current populations of animals that we have, the migration routes, things like that. This is an incredibly good opportunity for the Navy to address that and to support the scientific community in ways maybe beyond the EIS evaluation. But to say you know, if we're going to have MOA we're also going to support some science research beyond this EIS listing, you know. Just to say that that's an important national strategic point as well. That you know, in exchange for our maybe degradating the environment a bit, we're going to help the State and the scientific community know more for the long term benefit, overall benefit may be far greater from the science we learn than the small amount of environment degradation that occurs due to our operations out there for 16 to 41 days a year. So I really hope the Navy will look really hard in helping the scientific community which is dramatically under funded, to acquire some of that baseline data. Especially in the areas that you're getting ready to operate. You know, the Gulf of Alaska is some of	Please see Section 5.2.1.4 regarding research planned as part of the monitoring associated with Navy training events in the Gulf of Alaska. The U.S. Navy has developed a GOA TMAA Monitoring Plan to provide marine mammal and sea turtle monitoring as required under the MMPA of 1972 and the ESA of 1973. The GOA TMAA Monitoring Plan proposes monitoring goals for marine mammals that are unique with regard to their breadth as well as their focus on potential impacts of mid-frequency active sonar (MFAS) and underwater explosions on marine mammals and sea turtles. Additionally, to develop additional baseline data for the Gulf of Alaska, in April 2009, the Navy funded and NMFS conducted the Gulf of Alaska Line-Transect Survey (GOALS) to address the data needs for this analysis. Line-transect survey visual data to support distance sampling statistics and acoustic data were collected over a 10-day period both within and outside the TMAA. The Navy shares your concern for marine life and is very concerned about the environment. As such, the Navy is a leading sponsor of marine mammal research and provides a significant amount of funding and support to marine research.

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		the most difficult areas for the scientific community to get funding for. So that's mainly what I wanted to say on my second round. Thank a lot you guys.	In the past five years the agency funded over $100 million ($26 million in FY08 alone) to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals.
Paul Kendall 3-1		Oh, my name is Paul, middle initial D, Kendall. I think these moments are very, very special that we gather. And the reason that they are is it allows us a collective view of diverse opinions and unknown moments of not really going where everyone's at and allows us to reflect on our own values and ideas. And I wanted to thank you for your ability to come around again. In today's world we're seeing a tremendous repression of the ability to collectively communicate in some unhurried fashion. Some contemplated mode, the more complex our problems become in coming back to some greater understanding of balance is going to require a slower thought process due to the complexity to find a resolution. In having you allow a person to get up and have a fair share of time and then to come back around and circle, I think that's admirable and appreciative thing that deserves recognition. And I just can't stress enough that you should have these moments on camera, on video to share with the rest of the world. So that you can set the bar and show other people. It's very important, I think that all of our data be videoed on the internet. Something that's very magnificent that's happening there. And the reason I actually came up here was to -- I hope that you'll chose Kodiak, and Homer, and Seward, and Cordova, and those places to come in with a couple of ships. There is something magnificent and inspirational about those ships and the men and women that represent some of our more fundamental values that created this great country, that I think are immeasurable in the long term. And naturally you won't forget the energy science technology designated vessel to share with the community. And if I might -- one more thing real quick. To give you and idea of why I'm here to give you -- there are things moving very, very quickly sweeping across the, I think the entire plant, but especially America. There are over 40 manufactures of electric vehicles that are reaching in the next three years. In addition to that the Chinese have announced they are going all electric bicycles. And when you look at things like that, within three years every seven year old child in India, China,	This comment is duly noted. In response to concerns over climate change, Department of the Navy leadership has initiated broad programs to reduce energy consumption and shift energy demand to renewable and alternative fuels to the extent consistent with its national security mission, thereby reducing emissions of CO_2 and other GHG. The Navy has implemented a number of shore installation and fleet programs that have substantially reduced the generation of GHG, primarily through conservation of fossil fuels and electricity. Ashore, the Navy has aggressively encouraged its installations to reduce energy costs, both through facility competitions and through investments in solar, wind, and geothermal technologies. Energy conservation aboard Navy vessels at sea also has achieved substantial reductions in fuel consumption, and thus emissions of GHG. For further detail, please refer to Section 4.2.1.2 of the FEIS/OEIS.

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		and Asia is going to know more about the lithium ion battery and electron (indiscernible) they ever learned. And when you put that into the internet on such a worldwide scale the bookends of those impacts, then pour tens of the times we have never seen before, like an industrial revolution. This new sense of awareness that is now coming through energy, responsible energy management. It not only brings us a new individual freedom and will which we've never seen before. Because it's heading home and transportation. But they pour tons of new degrees of awareness. So, when I see these fleets that represent large amounts of energy in partnershipping and transitioning with the water bodies, the great water bodies. Which are really hydrogen. I think these are moments that I hope that you'll discuss amongst yourself -- maybe more than you are. And thank you again.	
Paul Kendall 3-2		Well, my name is Paul, middle initial D, Kendall. This is like my fourth time I think here on giving testimony. It's my first time to be at one of these. And I just wanted to note for the record that your people have been very accommodating and professional and amiable. And they've made me feel very comfortable. And sometime those little moments in our everyday events go unnoticed and I just wanted to give notice to that. And also your presentation allowing the individuals to come back up after a second comment, I think that really needs to be recognized. These meetings where we gather as a community, as a collective group are very important. They need to be unhurried and plenty of time. But more importantly sometimes when you take testimony from such a diverse gathering, you will actually learn things onsite in multiple orders or reviewing your thoughts. And it's important, I think to allow that person to have a second opportunity to come back up and reflect on a prior position of change or some new insight. And I thought that was really wonderful of being able to have that little nuance. Other than that you might have a little time clock up there with a large six or ten inch LED that -- where a person can see their time, and that way a person can have the dignity to shut themselves down when they're talking, which gives them more -- it empowers the individual to have more capacity to develop their personality and knowing the responsibility of time limit -- time limitations on talking. Anyway, thank you very much. That's it.	This comment is duly noted. The Navy appreciates your suggestions for these meetings and is working on implementing some of them for future Navy public meetings.

I.8.3 HOMER

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Paul Seaton 1		Commented as follows: Well thank you. I am Paul Seaton, I'm the State Representative for District 35, covering Homer, Seward, and the outer Kenai Peninsula. I received comments of concern from constituents at the initiation of the last training exercise. These concerns were mainly centered on the potential effects of new -- frequency SONAR on whales.	The Navy shares your concern for marine life and is very concerned about the environment. As such, the Navy is a leading sponsor of marine mammal research and provides a significant amount of funding and support to marine research. In the past five years the agency funded over $100 million ($26 million in FY08 alone) to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals. The Navy fully analyzed potential impacts to marine life from sonar, including whales in section 3.8 (Marine Mammals) of the EIS/OEIS. The analysis concludes that there is no significant impact to populations of marine mammals in the GOA.
Paul Seaton 2		I thank the Navy for scheduling this meeting here in Homer for the convenience of our local residents and I really appreciate it. Alaskan's are concerned about the effects of copper in fresh water and marine environments, especially on fish. This includes education of copper used in bottom paints in our fishing fleets, and also we're currently undergoing a review this month of -- by the Alaska Department of Environmental Conversation on the aquatic life standards for copper. As those have been seen -- the current standards have been seen not be adequate to protect juvenile salmon for their homing and responses to avoiding predation. So, I'm concerned that on table 3.2-22 on page 3.2-32, that the sonobuoys that are going to be used will increase the amount of copper discharge from the current level of 38.1 pounds to 2520 pounds under -- that's Alternative 2 versus the No Action Alternative. And the increase of copper from eight pounds to 540 pounds. And that first was copper thiocyanate, and so I would like to request that the Navy look at analyzing the use of a explosive charge to destroy those sonobuoys that does not incorporate those amounts of copper that would discharge into the Gulf of Alaska.	The Navy has studied the release of copper thiocyanate from sonobuoy seawater batteries, and determined that it would achieve a peak concentration of about 0.015 microgram/liter (Department of the Navy 1993). Text describing the anticipated maximum concentration and environmental fate of copper thiocyanate from sonobuoys in the marine environment has been added to Section 3.2.2.4, 3.2.2.5, and 3.2.2.6.
Paul Seaton 3		And so I appreciate that, I appreciate the fact that you are looking at the affect of mid-range SONAR on the whales, as that is a prime concern by my constituents. I don't have -- although I have a degree in biology, whale interaction was	With regard to sonar use, the Navy fully analyzed potential impacts to marine life, including whales in section 3.8 (Marine Mammals) of the EIS/OEIS. The analysis concludes that there is no significant impact to populations of marine mammals.

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		not that -- my expertise. So, I would appreciate you continuing to look at that. And thank you again for having this meeting here in Homer."	Please note that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The Navy's analysis indicates and this history indicates there is little relative risk to marine mammal populations from sonar training exercises as proposed in the EIS/OEIS.
Roberta Highland 1		Hi, I'm Roberta Highland. And I just found out about this meeting by reading the Homer News on Thursday. And I've always got issues when such a large amount of effort is put into having public meetings, that the people that are putting it together -- probably one idea is to contact any City Clerk office in the area that you're holding and they can give you the times, because really what would have been helpful was to have had this in the Homer News the week before because it's Saturday. And I just saw it on Thursday. It's just one way because of the cost and the work that goes into it. So, that would be my suggestion.	In order to contact as many people as possible and coordinate the logistics, public hearing locations and dates necessarily were identified in advance. With regard to public notification in Homer, three series of display advertisements were placed in the Peninsula Clarion. The first series of newspaper advertisements occurred after the NOA/NOPH was published in the Federal Register and ran for three consecutive days in the Peninsula Clarion. The second series of newspaper advertisements was published a week and a half prior to the public hearings dates. The third series of newspaper advertisements was published three days prior to the public hearing dates, including the day of the public hearings. Those dates were: 14 December 2009, 15 December 2009, 16 December 2009, 28 December 2009, 30 December 2009, 6 January 2010, 7 January 2010, and 8 January 2010. - In addition, two news releases were distributed by the Commander, Navy Region Northwest Environmental Public Affairs Officer (CNRNW EPAO) to media outlets, elected officials, and other potentially interested parties. The first news release was distributed on 11 December 2009, and announced the availability of the Draft EIS/OEIS. This news release included details on the Proposed Action, public hearings dates, locations, times and comment information. A second news release was distributed by the CNRNW EPAO on 31 December 2009, and announced the Navy's upcoming public hearings. This news release, meant to encourage the public to attend the open houses and presentation/oral comment sessions, provided detailed information on the location, dates, and times of the public hearings, in addition to comment information and details on the Proposed Action. - A public service announcement was distributed twice by CNRNW EPAO (31 December 2009, and 4 January 2010), announcing the public hearing locations, dates, time, close of

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			comment period, and project Web site. - Postcards announcing the availability of the Draft EIS/OEIS, comment information, and the public hearing dates, times, and locations were sent out to 691 individuals on the project mailing list on 23 December 2009. - Fliers announcing the public open houses and presentation/oral comment sessions for each of the five public hearings locations were distributed to 45 locations.
Roberta Highland 2		I always like to ask people to pretend that you're a whale, or a bird, or a fish, or other mammals when any of these decisions are being made. And just take it from that perspective so we're not doing it from our frequent human ideal and so anyhow that's just one of my ideas. Is really take that -- it sounds silly, but kind of take it seriously. And there are the decisions maybe change because of that.	This comment is duly noted.
Roberta Highland 3		And active SONAR sounds a little problematic, for sure. Underwater explosives sound problematic, and birds and fish dying sound problematic. I understand that you are doing a really good job on making sure that the least amount of environmental damage is done. But it's one of those consequences that happens no matter what.	Please see Sections 3.5 to 3.9 regarding an analysis of impacts to birds, fish, and marine mammals with regard to sonar and at-sea explosions. Additionally, please see response to Seaton – 3.
Roberta Highland 4		I'm also wanting the carbon footprint and pollution considered. And I don't know if that's being given the amount of consideration that it needs to be. Because every time a ship goes, an airplane takes off, any of the things that will occur, there is a carbon footprint and there is pollution that happens with that. And that needs to be something we really strongly take into consideration these days.	Carbon footprint and air pollution concerns including greenhouse gas emissions have been discussed in Section 3.1, Air Quality, and in Chapter 4, Cumulative Impacts. Additionally, the anticipated carbon dioxide emissions of the Proposed Action (the "carbon footprint") are quantitatively described under Cumulative Impacts in Chapter 4.2.1.
Roberta Highland 5		And I'm always wondering if there's not a way of doing it more frequently in a -- I'm trying to think of the word, where you are pretending you are doing it.	You are referring to "simulated" training. It should be noted that Navy and Marine Corps training exercises already use, to a large extent, computer-simulated training and conduct command and control exercises without operational forces (constructive training) whenever possible. However, as described in Section 2.3.2.4 of the EIS/OEIS, “Unlike live training, simulated training does not provide the requisite level of realism necessary to attain combat readiness, and cannot replicate the high-stress environment encountered during combat operations.” This section and Section 1.2.1 - "Why The Navy Trains," goes further to explain the importance of live training and the current limitations of simulated training.

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Roberta Highland 6		And I know that -- oh, 30 seconds, okay. I'm wondering about the time of year. Summer is when the mammals, and fish, and bird activity is highest and that seems to be a poor choice of time for these exercises. And I'll quit because my time is up. Thank you.	In Section 2.3.2.3 of the Final EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. The 'Alternative Locations' discussion explains why a change of locations does not meet Navy's purpose and need for the proposed action. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Robert Archibald 1		Good evening and thank you for coming down. Even though it was short notice, we're happy to see you here. And I'd just like to reiterate on what Paul said, that we've had a big battle going here with the androus fish stocks and the effects of copper on them. And it's proving that they are kind of dizzying their navigational systems.	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the EIS/OEIS, the Navy is confident that its training activities will not impact fisheries, fish populations, or the livelihood of fishermen in the Gulf of Alaska. In fact, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of fish populations. With regard to copper, the Navy has studied the release of copper thiocyanate from sonobuoy seawater batteries, and determined that it would achieve a peak concentration of about 0.015 microgram/liter (Department of the Navy 1993). Text describing the anticipated maximum concentration and environmental fate of copper thiocyanate from sonobuoys in the marine environment has been added to Section 3.2.2.4, 3.2.2.5, and 3.2.2.6.
Robert Archibald 2		So, the timing of these exercises -- if they're -- you know, if they're going to be at the same time that we're having fish stocks coming back into this Gulf of Alaska and heading up to the Bering Sea and Bristol Bay. And if this has any significant impact or increases any kind of chemicals in the water, copper be what it is, I don't know what you're using for munitions these days. I would have some problems with that at that particular time of the year.	This comment is duly noted. Please note that the Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As such, the Navy conducted a thorough analysis of impacts from its proposed activities to fish in Section 3.6. As described in the Final EIS/OEIS, the Navy is confident that its training activities will not impact fisheries, fish populations or the livelihood of fishermen in the Gulf of Alaska, and therefore will not impact fish stocks returning to Bristol Bay or the Bering Sea. In fact, there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of fish populations.
Robert Archibald 3		I would hope that if they doubled the length of these exercises they would take into account the time of year for migrations. And I would certainly hope that NMFS and the U.S. Fish and Wildlife Service would have a significant impact on that, as far as giving the Navy adequate information on that. Because I've sailed in and out of Prince William Sound a lot and it's going to be an area where there	As detailed in Section 3.8, migration patterns have been considered for all species throughout the Final EIS/OEIS. In addition, the U.S. Navy is consulting as required under regulations including the Marine Mammal Protection Act and Endangered Species Act which are administered by the National Marine Fisheries Service and U.S. Fish and Wildlife Service. Please note that none of the proposed actions involve

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		is an awful lot of mammal interactions. I so I just hope you sharpened your pencil on that one. And we don't want to see a whole lot of destruction out there with our fish stocks. So, thanks for coming.	Prince William Sound or the areas leading into and out of the sound, which is approximately 60 nm from the TMAA.
Olga von Ziegesar 1-1		Hi, my name is Olga von Ziegesar. I am the Director of Eye of Whale, a nonprofit research group here in Alaska. Our mission is to study and protect the humpback whale and to educate people of the status and the health of the species. We've been documenting the population of humpback whales in Prince William Sound and the north gulf coast of Alaska for 30 years. In 1966 the humpback whale was put on the endangered species list and protected and protected by the Marine Mammal Protection Act. In the 30 years of my study I have seen the population of the North Pacific humpback whale go from 3000 to 20,0000. About 5,000 of these whales migrate up into the north Gulf of Alaska to feed. This area includes the Cook Inlet, Kodiak, the Barren Islands, Kenai Fjords, and Prince William Sound, and the waters in between.	This comment is duly noted.
Olga von Ziegesar 1-2		It is known that military SONAR testing is very damaging to the soft tissue in the marine mammal skulls and organs. These effects can cause brain hemorrhages, mass stranding, and even death. Mid-frequency SONAR has been proved to be very destructive to whales diving and feeding behavior. They will avoid the intense sounds by surfacing too quickly and causing conditions similar to the bends. Now you may think that the military tests would be harmless if they were done in the winter or slightly off season, and not during the summer months when the whales are definitely most abundant in these areas. We are now finding that many whales stay in the northern waters during the winter to continue their feeding. Hydro phone arrays hung from buoys in the Gulf of Alaska have recorded whale songs and calls during every month of the year. You will say that your plan is to have observers aboard to watch for whales. When they are present the testing will be ceased. Marine mammals can hear for many miles underwater. And from the deck of a ship a whale blow can only be seen if it is within a couple of miles. For these reasons it will be impossible to avoid effecting the whales and other marine mammals during any time of the year in the Gulf of Alaska.	The Draft and Final EIS/OEISs use the most current, relevant scientific information to develop the analysis on sonar training and potential impacts to marine mammals. Please see Section 3.8 regarding what is known with regard to sonar impacts to marine mammals. As detailed in Section 3.8, Navy is aware of acoustic monitoring results indicating the presence of many species year-round in the Gulf of Alaska. As explained in Section 2.3.2.1 of the Final EIS/OEIS, a rescheduling of training activities outside the summer months would not support the Navy's Purpose and Need and was therefore eliminated from further consideration. The Navy's protective measures are effective at mitigating, not eliminating, risk to marine mammals. Based on the analysis included in this EIS/OEIS, including the Navy's history of operating sonar in the Pacific Ocean with no recorded evidence of harm to marine mammals, the Navy feels its protective measures are adequate. Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness Training is required before every sonar exercise. Chapter 5.0

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			of the EIS/OEIS, Mitigation Measures, presents the U.S. Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. While the Navy is very confident in its well-trained lookouts, it does not expect that all animals present in the vicinity of training events will be detected. The acoustic impact modeling estimates provided in the EIS/OEIS are not reduced as a result of mitigation effectiveness, even though many marine mammals will be detected and sonar exposures will be avoided.
Olga von Ziegesar 1-3		Finally, the humpback whale population is recovering to healthy numbers. And now the Navy proposes to endanger them with intensive SONAR and explosives. It seems to me that we must change something if protecting our country means sacrificing the whales. Thank you.	The U.S. Navy has conducted training using mid-frequency active sonar without incident for decades in Hawaii without any apparent impacts to humpback whales, including within the designated humpback whale sanctuary. There is no evidence of broad-scale impacts that are either injurious or of significant biological impact to any marine mammals from those locations. The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. Because there is no indication from areas where the Navy routinely trains that training activities have a negative impact on the health of the marine environment, the Navy is confident that there is little relative risk to marine mammal populations from active sonar training or any other training events.
Sue Christiansen 1		I to want to thank you so much for this public process. I thank you for your service to the United States and all of you in your professional roles, your expertise, your commitment to science, and research. I just found out about this today as I was flying in on Era on the same flight as all you guys. So, I'm glad I was able to be here.	This comment is duly noted.

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Sue Christiansen 2		And what I remember, I think it was about five years ago the Navy was doing research off the coast of New Zealand on SONAR -- on new acoustics. And maybe you guys - - are you familiar with that? I heard about this from NPR and I've thought about it after I got off the plane this morning. But there was like a hundred whales that breached [sic], and it -- you know, it started out with about 20 and they tried to figure out what was causing the problem. And it turned out after several years that it was demonstrated or proven that it was the new acoustic SONAR research that was going on that was effecting them. And I just don't want to see that happen here. And I know that everyone involved with the Navy or no one in the Navy wants any of our marine animals to be injured in any way or you have a good intention as well, and that you are doing the best of your -- to your abilities to protect our nation. And have the highest good in mind for all species. And I would just say, my feeling at this time is I think it's a little early for us to be doing this kind of research - - or you know, the games or the activities that you've presented happen here.	Please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding incidents around the world. Please note the Proposed Action includes no testing of new weapons, but rather the training of Navy personnel with established sensor and weapons systems. Additionally, the Navy fully analyzed potential impacts to marine life from sonar, including whales in Section 3.8 (Marine Mammals) of the EIS/OEIS. The analysis concludes that there is no significant impact to populations of marine mammals.
Sue Christiansen 3		And I support no action alternative at this point. And I'm not sure I support the research for SONAR, if it has the effects of breaching [sic] whales or that kind of thing. Okay, that's it.	As explained in Section 1.4 of the EIS/OEIS, the decision on which alternative the Navy will pursue will be made in light of the Purpose and Need by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process. As stated earlier, the Proposed Action includes no testing of new weapons, but rather the training of Navy personnel with established sensors and weapons systems. Also stated above, please see the full analysis of marine mammal strandings in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding situations across the world.
Amy Christiansen 1		My name is Amy Christiansen, I've lived in Homer -- in and out of Homer for years. But I have some real questions for you guys that don't seem to be addressed, as in how far does the SONAR blast travel? How loud is it 10 miles away? How loud is it 200 miles away? What happens when it comes in contact with some shelf or something? I mean that kind of information, I don't think we really have.	Information of this general nature was presented in Table 3.8-5 with regard to Navy's most powerful surface ship mid-frequency sonar. As that table shows, if the conditions were perfect for sound to be conducted across the entire distance (which is not likely to happen), a sonar ping at 3.5 kHz beginning with a source level of 235 dB was modeled as traveling a maximum of 105 km (approximately 57 nautical miles) in a homogenous water column by the time it had undergone transmission loss resulting in a level of 120 dB at

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			that distance. How "loud" the sound would be perceived at that distance underwater is, again, subject to many variables since some marine mammals (like blue whale) likely cannot hear a sonar at a frequency of 3.5 kHz so there is no means to accurately answer the question. At 10 miles from the same source, dependent on the conditions such as the presence of a distinct temperature layer at depth and the depth of the receiver in the water column, it is possible the sound could not even be present at all.
Amy Christiansen 2		I heard a couple people state that we don't really know that much about marine mammals. We really don't. And for me, just from my heart SONAR -- just discharging SONAR for -- I mean, I would really want to know better reasons what science you're really trying to determine here. Or what is the whole weaponry involvement? I haven't heard a link there. I mean it's nice -- the posters are nice and I do appreciate the chance to talk about it. But I don't feel that it's worthwhile if you really don't know what we're studying yet to harm any marine mammals.	Sonar is a sensor not a weapons system and active sonar in fathometers and fish finders are used by many vessels at sea. The Navy is proposing to use active sonar in Anti-Submarine Warfare training events; there is no testing involved in the proposed training. The EIS/OEIS uses the most current, relevant scientific information to develop the analysis on sonar training and potential impacts to marine mammals. This analysis (in Section 3.8) was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. The Navy will continue to provide a significant amount of funding and support to marine research. In the past five years the agency funded over $100 million ($26 million in FY08 alone) to universities, research institutions, federal laboratories, private companies, and independent researchers around the world to study marine mammals. In addition, as described in Section 5.2.1.3, there will be marine environment monitoring for the purpose of determining any detectable impacts as a result of the training events proposed.
Amy Christiansen 3		I also wonder if there's a lot of this training and stuff going on in California -- I know California and Alaska are different, and waters are different. But I always wonder why -- or I feel like, they can't get away with it in California, so they might be coming up to get away with it in Alaska. And I would really like that issue addressed. Because there's more population in California - - I mean, that part is real for me. And it might be ridiculous because it is different ocean you know, waves or whatever. But some part of that is real for me. That I would like that addressed.	The Navy has been, and is still, conducting similar activities off the coast of California, in the Pacific Northwest, off the coast of Hawaii, on the east coast and in various other places around the world for decades with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals at those locations. The Navy is also conducting similar analysis and environmental planning at each Navy range complex. As explained in Chapter 1 of the EIS/OEIS, part of the selection criteria for choosing Alaska as a training location is whether the proposed action meets the Navy's purpose and need. As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to

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			other locations. Such alternatives fail to meet the purpose of and need for the proposed action.
Amy Christiansen 4		And more notice would have been nice. And what else did I think? Oh, like in the book -- science is always a little bit lagging is what I found. If you take sea otters, which are mentioned in your environmental impact study, they are now listed, they are now -- critical habitat has been named. And that's not included in your thick book. And I'm sure that thick book took a long time to put together, but that's something too that is apparent to me. So, okay thanks.	Sea otters are discussed in Section 3.8 of the EIS/OEIS. Additional text has been provided in Section 3.8.1. Please note that since the TMAA is far offshore and well beyond the sea otter Critical Habitat, sea otters are not likely to occur within the TMAA because of two factors: foraging diving depth limitations (ranging from 2 to 75 meters [6.5 to 246 feet]) and the bathymetry of the TMAA (typically deeper than 100 meters [328 feet]).
Whitney Lowe 1		My name is Whitney Lowe, I'm here from Homer, Alaska. And as with everybody else I'd like to thank you very much for giving us the opportunity to be able to comment this evening on this issue. The Navy has a history of poor environmental stewardship including dumping high volumes of garbage into the ocean as well as toxic materials from explosive ordinance. And consequently it is difficult to believe what they might say about being responsible for the environmental impacts of these actions.	The Navy is very concerned about the environment and actually has an excellent record of stewardship. For more information in this regard, see the Navy's Currents Magazine at [http://www.facebook.com/pages/Washington-DC/US-Navy-Currents-magazine/112833481868]. Shipboard waste-handling procedures governing the discharge of nonhazardous waste streams have been established for commercial and Navy vessels. These categories of wastes include solids (garbage) and liquids such as "black water" (sewage), "gray water" (water from deck drains, showers, dishwashers, laundries, etc.), and oily wastes (oil-water mixtures). See Section 3.3.1.2 of the FEIS/OEIS for further details.
Whitney Lowe 2		And I can understand in these times of international terrorism, it's easy to throw out the fear card and say, that all these training exercises are necessary to keep our country safe. But trumping up peoples fears has routinely led to trading off the health and safety of human and other animal habitats because supposedly it was going to make us safer. At some point it would be great that we might learn that the answer to making us safer doesn't result from bigger and more powerfully destructive weapons, nor from destroying our surroundings in the pursuit of those weapons.	This comment is duly noted.
Whitney Lowe 3		At the present moment we have a situation of drastic concern with our worldwide fisheries and marine environment. A November 2006 article in the Journal of Science suggested that there will be virtually nothing left to fish from the seas by the middle of this century if the current trends of catastrophic fish populations declines continue. The primary culprits in this involve over fishing, pollution, and other environmental factors.	This comment is duly noted.

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Whitney Lowe 4		In the face of these issues it's totally irresponsible to increase military training, which involves toxic dumping and tactics known to kill and injure marine life.	The Navy shares your concern for marine life and the health of the ocean and the Navy does not dispose of toxic waste by dumping it at sea. Furthermore, the Navy has conducted a thorough analysis of potential effects from its proposed activities in Chapter 3 of the EIS/OEIS. Because there is no indication, in the area where the Navy trains, that training activities have a negative impact on the health of the marine environment, the Navy is confident that there is little relative risk to the marine environment from active sonar use or other training events.
Whitney Lowe 5		We should be going to great lengths to do anything we can, not only to mitigate the current practices that are causing precipitous decline, but to reverse this trend. To engage further military exercise in this region that is extremely rich in sensitive marine life is a blunder of epic proportions and represents incredibility poor judgement.	This comment is duly noted. Please see Chapter 5 of the EIS/OEIS, Mitigation Measures, which presents the Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events.
Whitney Lowe 6		Our children and decendents in who's hands we are going to leave this incredibility injured world will be asking us, what were they thinking? We can afford to participate in this process, as it represents the epitome of irresponsibility and drastically poor judgement. Thank you.	This comment is duly noted.
Don Lane 1		Thank you for this opportunity -- thank you for this opportunity to speak. This nation's security is a big and the Navy has always played a large role in the safety and security of this country. It's a large part of the success that we all enjoy, and the freedoms that we all enjoy. Having said that, I also understand the taxpayers investment in the tools of that security, it's important to practice. And it's important to understand those tools and it space and it takes time to practice.	This comment is duly noted.
Don Lane 2		Having said that, this map -- the western boundary of the practice area or the football field, as it described to me goes up on the shelf in the Gulf of Alaska. When it goes from dark to light is right around 150 fathom break. Now to the west of that break and over to the edge of the yellow line, that is some of the richest bio-diversity in marine fish as you'll find any place in Alaska. I have spent years out there fishing, long lining, pulling pots and from Montague Island down to off of Kodiak. There are sharks, they are skates, there are halibut, there's grey cod, they are fish there that have air bladders, they are fish there that don't have air bladders.	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the EIS/OEIS, analysis of impacts to fish, including those with swim bladders, are found in Section 3.6. The shallow water shelf area including Portlock Bank referenced in the comment is too close to the borders of the TMAA and would unnecessarily constrain maneuverability. As such is not a likely operating area where at sea explosions would be occurring.

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		There's this huge bio-diverse population that are -- fish that are there year round. My concern is; is that some of that water that's up on that shelf, it doesn't show on that picture, is 150 to 180 feet deep. It's not very deep, there are -- Portlock Bank area up there that's 35 fathoms, off of Montague Island, sticking south of that island there's an area -- it's all less than -- some area of it are less than 200 feet deep. And imagine a huge explosion on that wall and you're over here. And you're a fish on the bottom. That's about the distance between the surface and the fish if there was an explosion. So what I would like to see, while I know you need the area to practice.	
Don Lane 3		There was the comment about the sinking of the ship, as the target would be in 1000 fathoms. I think it's important to consider any ordnance or major explosions that were to occur during the practice should be off of that ledge into 1000 fathoms. It's not that far to move off that shelf to deep water. It's an area of maybe five miles to break from 180 fathoms down to over 1000 fathoms. And the difference between being that wall to this wall in a major explosion and all those fish that are laying on the bottom and 1000 fathoms is a mile. So, that would be my only is; is that western -- that western shelf there is -- when you talk about environmental impact, there's a lot of environment there. And some of it is not very far down. And if it was considered -- you know, you could drop a bomb there in any of that area, that would be a mistake in some of those areas, because it's not that deep.	The vessel used for SINKEX is placed in a specific location that is greater than 50 nm (93 km) out to sea and in water depths greater than 6,000 ft (1,830 m) (40 C.F.R. § 229.2) so that when it sinks it will not be a navigation hazard to marine traffic. These parameters would not allow for any activities to occur on the continental shelf due to the distance and depth requirements. See Figure 2-7, “Possible locations of a SINKEX within the TMAA”, for a graphic representation of the areas that meet SINKEX requirements.
Elise Wolf 1-1		My name is Elise Wolf. I'm on the Board of Directors for the Kachemak Bay Conservation Society. Thank you for being here. And I'll ditto what everyone else has said. While we appreciate you coming to Homer, I have some issues. And I'm surprised that you're not in Seward because as you can see this map shows -- there's a few tourism operators, whale watching companies that probably would have something to say to you that probably wouldn't be very nice. And I think you missed them in your environmental impact statement. You also missed Glacier Bay, I mean if we're going to mimic the French like they do bombing Tahiti, why not hit Glacier Bay too? I mean you picked two -- one of the second most important areas for tourism in Alaska other than Glacier Bay for whale tourism. So, I'm just wondering	Public hearing locations were determined based on the location of potential or perceived impacts to the human environment. Because of the large geographic area of the GOA ATA's, it would be an imprudent use of taxpayer funding to conduct public hearings where there are limited or no potential impacts. As such, the Navy chose locations that would enable it to contact as many people as possible without imprudent use of taxpayer funding to conduct public hearings. Three locations were originally chosen for public scoping meetings. Based on feedback from the public scoping meetings, the Navy added two additional public hearing locations for a total of five in Alaska: Anchorage, Cordova, Homer, Juneau, and Kodiak.

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		why we're not in Glacier Bay as well?	
Elise Wolf 1-2		Now the only reason that you can say that there's no significant impacts on whales is because you deny the impacts from seismic sound on whales. You have been sued over this. The Navy has been sued, and you're going to be sued again. Not by our little company or little group down here in Homer. But by the other big environmental groups, which don't bother to come to these because they are already planning suing you. So, we can just expect that. But that's why. And the only reason that you can deny impacts on whales is because you're getting your legal advice from the tobacco industry or some other company that -- lawyers that tell you that if you wait 50 years and say that there's no correlation long enough, then everyone will start to believe it, until the suits finally start coming in, and the death toll is high that you can't deny it.	There is no use of seismic sound sources proposed in this EIS/OEIS. The science of sound in the water and its effects on marine life is evolving. The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, as required by NEPA. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. Please see Section 3.8 for a full discussion of potential impacts on marine mammals including whales.
Elise Wolf 1-3		Now there is one antidotal evidence and antidotal evidence that shows that beaching occurs with whales and all the other things Olga said. There are science professors around the world that testify on this all over the globe. So, this is something that you just simply are choosing to ignore. There's no evidence to the contrary.	A complete analysis of marine mammal strandings is in Appendix F of the EIS/OEIS – Cetacean Stranding Report. The report discusses the various stranding situations across the world. In addition, there are discussions specific to species presented in Section 3.8. The best available science is considered in preparation of this EIS/OEIS. As a general matter, the Navy shows consideration of the best available science when we ensure the scientific integrity of the discussions and analyses in the GOA TMAA. Specifically, this EIS/OEIS identifies methods used, references reliable scientific sources, discusses responsible opposing views, and discloses incomplete or unavailable information, scientific uncertainty, and risk (See 40 CFR,1502.9 (b),1502.22,1502.24).
Elise Wolf 1-4		The other issue that you have is -- well your timings bad. But as Olga says, maybe there is no good timing.	In Section 2.3.2.3 of the Final EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Elise Wolf 1-5		Your mitigation is inadequate.	Please see response to Olga von Ziegesar 1-2.
Elise Wolf 1-6		Your cumulative impacts are inadequate.	The cumulative impacts analysis addresses the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. Table 4-1 succinctly depicts the categories of past, present,

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			and reasonably foreseeable future actions that affect marine populations. Identifying such activities and in fact comparing them for relative impacts is an appropriate approach to cumulative impacts analysis. The EIS/OEIS analyzes in detail the effects of Navy actions on specific resources, and places those in the context of other sources of impacts.
Elise Wolf 1-7		Climate change shows that Ph changes are proving to increase the conduction of sound in our oceans. That's completely absent in your environmental impact statement. So, you are -- your cumulative impacts, which would include climate changes and the impacts thereof, and these pH changes that we now have evidence of are completely absent in your document. And I'm going to go ahead and wait until my time is up. Thank you.	Climate Change and Ocean Acidification are addressed in Section 4.2.1.2 of the EIS/OEIS. Please note that while current literature supports the hypothesis that acidification will increase the propagation of sound, most models and calculations show the effects to be limited to lower frequencies (~ 1–3 kHz and below). The current literature indicates that sound travels farther due to changes in the amounts of pH-dependent species such as dissolved borate and carbonate ions, which absorb acoustic waves. The effect of changing pH on mid and high-frequency sound propagation is currently being explored.
Mako Haggerty		Hi, my name is Mako Haggerty. I run a water taxi here, but I think for this event I'll be an assemblyman, which I was just recently elected to assembly. So, I'll speak from that standpoint. So, I want to thank you for coming here. And the displays here are very informative and I really appreciate that. I learned a lot tonight. I think this openness that we have here is really important. And what I seen on the -- not this slide here but the one that had the deadline for the comments to the EIS is January 25th, which gives the impression that the communication is going to stop between the coastal communities here and the Navy on the 25th. And I would hope and ask you, to please keep the communication open between the coastal communities beyond that deadline. Because there's going to the things that we learn and there's going to be things that you learn, and I would think that a healthy exchange of that information needs to continue beyond that deadline. And you're all real nice people. And I understand why they sent you here, because you are nice people. And we like to you know, sometimes we can be confrontational and you've -- and there's a reason for that. Is because we get the nice people and then you go on and do what you're going to do anyway. And a lot of times those of us that live in these coastal communities get a little tired of that. And so, I guess the	This comment is duly noted. The Navy is always looking for ways to better improve its public outreach capabilities and processes. The Navy has kept the website up and open during the entire EIS/OEIS process to keep the lines of communication open. The Navy complied with NEPA requirements in the development and consideration of alternatives. This FEIS/OEIS analyzes all alternatives in Section 2.3 and explains why the Navy has considered but eliminated alternatives in Section 2.3.2. The decision on which alternative to pursue has been considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.

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		main point is let's please keep the communication open. If there's going to be things that are going to impact the various communities in this area, we would like to be made aware of that in a timely fashion. And also if you learn anything, please let us know what that is. We like to learn things here too. Anything about the whales or the environment and we learn things and maybe you'd listen to us too. Thank you.	
Todd Hoppe 1		Thank you. My name is Todd Hoppe, commercial fisherman here in Homer and appreciate you gentlemen coming and giving me the opportunity of speak. I don't -- actually could you go back to that map please. I also am concerned about the continental shelf also. I make a large part of my living along there, and I'm concerned that DON explaining of activity along there.	The Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. The majority of the TMAA is located off the continental shelf and in deeper water of the Gulf. Impacts to fish under the proposed action from explosions would be possible, but these elements of the action are not expected to have measurable or detectable impacts to fish given the vast area encompassing the TMAA (42,146 nm^2 [144,557 km^2]). In addition, please note that long-range advance notice of scheduled activities and times are made available to the public and the commercial fishing industry via the Internet. The local 17th District U.S. Coast Guard Notices to Mariners may be found at: http://www.navcen.uscg.gov/lnm/d17/. These sites provide the public notice that the military will be operating in a specific area and will allow you to plan activities accordingly to avoid potential conflicts.
Todd Hoppe 2		And you know, if say there was going to be some impact with whales and it did -- it wasn't learned until later on down the line from your things.	Monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS.
Todd Hoppe 3		The commercial fisherman will be the one's that are targeted first. You'll come up and do your test for 14 or 21 days, and go and what not. And down the line if something does happen it will be the commercial fisherman that are blamed	As described in Section 5, monitoring associated with the training events is planned in addition to a stranding protocol should something unexpected occur. Taking into consideration that there is no indication, in any area where the Navy trains,

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		for it first. In my opinion and in my experience in what we seen happen with steller sea lions and what was proven scientifically afterwards.	that training activities have a negative impact on the health of the marine environment, the Navy is confident, and the analysis indicates, that its training activities will not impact the marine environment off the Gulf of Alaska.
Todd Hoppe 4		And I'm also was here to make a comment on a comment - - public comment you had in Kodiak that your staff was maybe aware of, that there was a suggestion that you could hire some boats to do a fair amount of fishing to try to get the sperm whales to congregate in an area outside your boundary area. And that possibility could work. But what wasn't considered in that is who's going to be -- how do I want to word that -- there's not going to be anybody responsible for the quota. That's not going to come off the quota. It will be -- I'm not wording that right, I've got a fart in my train there. The fish will not be accounted for. Right now we're in a quota system, every fish -- every pound that's caught is accounted for. If you have boats fishing black cod to try to pull the sperm whales out of your area -- your test area, those fish aren't really going to be eaten and not accounted for out of the quota. And that's a reverse -- negative impact on the quota. So, thank you very much for your time.	Because it would be considered a behavioral harassment under the Marine Mammals Protection Act and would affect an Endangered Species, the Navy does not intend to implement mitigation measures that attempt to relocate sperm whales by fishing for black cod. Proposed mitigation measures to be implemented have been discussed in Chapter 5 of the EIS/OEIS. Section 5.2.1.6 which discusses other alternative protective measures that have been considered but eliminated for implementation.
Brenda Dulma		I just wanted to share -- I'm Brenda Dulma. And I just wanted to share what my daughter said when I just said that there was potentially going to be testing in the area. And this was her one response, how can we think about this when we have genetically unique species in our area. And that was her concern. So, I just want to share that and that may have been addressed, but -- and since I'm late, I was spending time with my child. So, I just wanted to share that. That we need to consider the bio-diversity that we have in this area, it's very unique. And that needs to be seriously considered before you make any final decisions. Thank you.	The Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS. The Navy is not proposing to conduct any testing, but is proposing to continue conducting training as have in the past with the proposed addition of some new activities as described in Chapter 2. Please see Chapter 3 of the EIS/OEIS for the description and analysis of potential effects. Chapter 4 includes cumulative analysis of all past, present, and reasonably foreseen future projects by the Navy and non-Navy activities.
Stephanie Zuniga 1		My name is Stephanie Zuniga and I am a teacher, third through sixth grade as well as I used to be sea bird biologist for Fish and Wildlife Service. And I also just heard of this last minute through a friend. And I wish I would have heard about it before because our kids right now are studying currents. And involved with that are current events and currents in our oceans. And last quarter we studied communication. So this is a perfect -- I'd love for them to	Please see response to Highland – 1.

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		have been here tonight. And if you want to stick around until Monday to come into the schools. So I would love to share this with my students because it's -- this is their playground, this is their home, this is where they are going to grow up and fish, be fisherman and fisher women, be tour guides, be scientists, biologists. And this matters to them and they need to be involved in this process of public comment as well.	
Stephanie Zuniga 2		When I was a biologist I worked in the Gulf of Alaska on the Barren Islands. And that area -- it's highlighted, is within breeding grounds of sea lions, within the main feeding grounds of sea birds and humpback whales. I mean I remember standing on -- or sitting on cliffs watching our sea birds and taking down data and looking out you know, for miles away and just seeing humpbacks feed. I mean, 20 humpbacks feeding. And you know, I'm looking just -- just in that area where that yellow is. And I'd be concerned, I'd be really concerned and I'd want to know more before just going in there and doing that. Especially that time of year. It was interesting to hear Olga's comments about that all times of year will effect these whales. But they are feeding, they are getting the bulk of their food in them before they head on south -- some of them. Thank you. Thanks for coming.	As per Chapters 1 and 2 of the EIS/OEIS, with the exception of Cape Cleare on Montague Island, the TMAA is located over 12 nm (22 km) from the northern point of the TMAA, the nearest shoreline (Kenai Peninsula) is located approximately 24 nm (44 km) north of the TMAA's northern boundary. The approximate middle of the TMAA is located 140 nm (259 km) offshore; the location of the TMAA has been chosen as a location adequate for training and for the least possible effects to critical habitats.
Elise Wolf 2-1		My name is Elsie Wolf and I'm on the Board of Directors for Kachemak Bay Conservation Society. This is a continuation of comments previously started. For the audience, there is significant research done by Natural Resources Defense Council on SONAR and seismic testing. So this is a good website to start going in and looking at links. Don't read the environmental impact statement and expect that to be completely fully disclosed information about seismic testing and impact on whales or fish. This is highly concerning.	Please note that seismic testing is not part of the Proposed Action. Because of the differences in sound characteristic and sound propagation (impulsive versus continuous noise), the analysis of each noise source (seismic and sonar) and their effects are independently evaluated.
Elise Wolf 2-2		And so let's talk about mitigation for a minutes. Because your mitigation suggests that you're going to power down and shut off your engines. Well we know from what's going on in the Arctic -- seismic testing right for oil and gas development, that it's highly expensive -- very expensive for a vessel of that -- of these sizes to power down. It's extremely costly. So what happens is in the mitigation plans, note p-l-a-n-s, plan, it says that you'll power down. But in reality, Shell for example has yet to power down, because	The power down directives in Navy mitigation measures are related to sonar power downs and not engine power downs. Potential impact from engine noise is also discussed within respective biological resource sections. As stated in the above response, seismic testing is not part of the Proposed Action. Additionally, sonar is just one of many sensor systems onboard Navy vessels. As such, powering down or even shutting down sonar would not prevent the continuation of overall training. These mitigation measures have been used

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		it's too expensive. So they come back a year later when they do their reports to the National Marine Fisheries Service and have in an armful or basketful of excuses as to why they couldn't power down.	since 2006 and Navy has implemented these measures during training, which has been reported to NMFS as required. It should be noted that the U.S. Navy in conjunction with NMFS and USFWS is best suited to determine what mitigation it can effectively use during its training and testing activities to mitigate harm to marine mammals while still being able to meet its operational needs to train for real-world conditions it may face. Please refer to chapter 5 of the EIS/OEIS which presents the US Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events.
Elise Wolf 2-3		And then let's talk about the people that are standing on your decks. These three people or however many. Are they going to be standing on the decks when you're out in 25 foot seas? How about eight foot seas? How about a cloudy day? How about the dark? How about five hours of daylight in the middle of the -- of you know, December 31st. These are unrealistic mitigation plans.	Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion of Personnel Qualification Standard Program. NMFS-approved Marine Species Awareness training is required before every sonar exercise. In addition, as noted in the Final EIS/OEIS in Section 5.2.1.2, all Navy surface ships participating in anti-submarine warfare exercises will have two additional personnel on watch as lookouts. While the Navy is very confident in its well-trained lookouts, it does not expect that 100% of the animals present in the vicinity of training events will be detected, especially in conditions of limited visibility as described in the comment. The mitigation measures are designed to reduce potential impacts, not to guarantee they will not occur. Please note the proposed training would be scheduled for the summer months and would not take place in the winter timeframe (such as Dec 31). Please see chapter 5 for a complete discussion on the Navy's mitigation measures.
Elise Wolf 2-4		Now you're talking about this in the middle of summer, and this is probably why. Because you have 18 or 19 hours of daylight.	In Section 2.3.2.3 of the EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.

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Elise Wolf 2-5		Still, we have experts in the Arctic Ocean right now, natives who cannot identify whales, and don't know the difference between a bearded seal and a ring seal. So, if Shell is having these problems and they're doing this all the time in these Arctic waters, then I'm not sure -- I don't -- I not -- I don't have any confidence that this is going to happen. National Marine Fisheries Service rubber stamps this stuff all the time.	Please see the response to your third comment above (Elise Wolf 2-3).
Elise Wolf 2-6		The fact that we are coming up with no significant impacts concerns me greatly. There's one final comment that I have to say, in that there is philosophical and spiritual and ethical proof if you want to call it, or cultural standards among most human societies that place some level of inherent of value. And what I mean by inherent value, that is the value of a being outside of the human want and desire. And that is completely absent in your plan. Thank you.	Your comment is duly noted.
Roberta Highland 2-1		My name is Roberta Highland and I didn't have time to prepare comments because I did just find out about this meeting. Now that I've heard the comments of people that really know what they're talking about in this area. I have become very alarmed. And I going to ask a question later. And what I would really like to see you do is don't go back to your stations, I would prefer that you take questions from the audience so we can all hear the answers. And I would really hope you will do that since you spent all the money and time to get here. That would be -- that's our usual preferred way of being able to communicate with you. So when we get to that point I am going to ask about ocean acidification. And I'm going to find out what the Navy is doing about ocean acidification.	From past experience, the Navy has concluded that the open house format used during the public hearings is the most conducive to effective dialogue and fosters a peaceful and non-confrontational setting for all involved. Additionally, all five public hearings held in Alaska exceeded NEPA requirements. Adequate time was given during each meeting to ask questions of a number of subject matter experts. All public concerns have been analyzed and addressed in the Final EIS/OEIS.

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Roberta Highland 2-2		And now that I've heard, and I should have figured that out, that this is really a rich area. It's incredibly rich. And what in heavens name are we thinking of even having allowed these types of activities to go on before? I am now feeling like this is a very poor place -- I don't know where a good place is. But this is not one. So, I'm going to be going on record saying, I don't what this activity going on in this area at all.	The Navy is aware of the abundant marine life in the area and has conducted a thorough analysis of potential effects in Sections 3.5 to 3.9 of the EIS/OEIS. However, to implement its Congressional mandates, the Navy needs to support and conduct current and emerging training activities in the GOA ATA's to enhance and sustain its training. These objectives are required to provide combat capable forces ready to deploy worldwide in accordance with U.S.C. Title 10, Section 5062. As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.
Roberta Highland 2-3		And the other thing I'm going to bring is my four E's. And my four E's is something I would like to go national, state, worldwide when anything is brought up to make decisions on. Is economy, environment, energy, and ethics. And I am trying to get this being used as a template for every decision that gets made. And when I talk about ethics, I mean is it ethical for the animals, is it ethical for anything? Is it ethical for the worms? Of what we're planning on doing. But when you take into consideration economy, environment, and energy -- what the kind of energy use is being taken to do any of these things. And what the consequences are. I am trying to get that nation, worldwide and you could help. And I hope you think it's a good idea. Thank you.	This comment is duly noted.
Olga von Ziegasar 2-1		I also have not followed -- my name is Olga von Ziegesar. I'm from Eye of the Whale and I study humpback whales in Alaska, in the Gulf, and in Prince William Sound. And there are huge numbers that migrate along that shelf there. And we actually don't know exactly how they migrate out in the deeper waters, but there definitely been sightings of even Southeast Alaska humpbacks up there. So, they must circle somewhat before they go to their destinations to feed.	This comment is duly noted. Section 3.8 discusses the recognized presence of humpback whales and other marine mammals and includes an analysis of effects to marine mammals from the proposed Navy training activities. As presented in Section 3.8, the Navy does not anticipate any population level effect on humpback whales in the Gulf of Alaska from Navy training activities. The use of tracking data (for example as detailed in Section 3.8.3.3 for humpback whales) was used in determining the likely presence of marine mammals in the TMAA.
Olga von Ziegasar 2-2		I know that there have been a lot of studies on this SONAR. It's been going on for years off of Hawaii, off of New Zealand, off of California. The last Marine Mammal Conference there were lots of papers on the effects of the SONAR. It's hard for me to believe that we don't know more than you're saying. And I -- I'm afraid I haven't read	Please see response to Olga von Ziegesar 1-3

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		everything on it. But, I would propose that there be no SONAR and no explosives. I can see -- I was told that it's important that the boats come in that close so that they can fly up into these interior areas. But, I still don't really see why we should take any chances with SONAR or explosives. Thank you.	
Stephanie Uniga 2-1		I just -- my name is Stephanie Zuniga. And I just want to -- and somebody made the comment of how ocean acidification or the change in pH in our oceans is changing the way that sound carries underwater. And I -- this is pretty new for a lot of us. And I just wanted to suggest to those involved in making these decisions with our communities to watch A Sea Change, which is a movie, a documentary that is going to be here in Homer on Tuesday night I believe. I hope everyone here gets a chance to go watch that. It's on ocean acidification and there is website, a sea change.com I think it's called. And I would suggest that that be viewed by our decision makers, as an educator. Thank you.	This comment is duly noted. Please note that ocean acidification is addressed in Section 4.2.1.2 of the EIS/OEIS.
Robert Archibald 2-1		My name is Robert Archibald again. And I'm looking in this booklet here, and I haven't had much of a chance to look at your EIS. But, one thing that caught my attention is when they would power down. Is that going to be active SONAR at 1000 feet or 1000 yards? And again, shut it off at 500. And I don't know if that -- I do know that at 1000 yards it's still a pretty strong signal. And I don't know the research that's gone on there. But in a high population of mammals it seems a little ridiculous to me to expect to be able to be able to provide a safe environment at 1000 feet when you're going to shut them off.	The mitigation measures detailed in Section 5.2.1.2 include the first power down of active sonar at 1,000 yards from a detected marine mammal, a second reduction at 500 yards, and shut down at 200 yards. These mitigation measures were developed to minimize exposing marine mammals to sound levels that could cause TTS or PTS as described beginning in Section 3.8.7.2. Implementation of the safety zones discussed above will prevent exposure to sound levels greater than 195 dB re 1µPa for animals sighted. Lookouts are responsible for monitoring a much larger area and are expected to report everything observable within 10,000 yards of the vessel.
Robert Archibald 2-2		And also, I'm a little disappointed in our State for not putting up a little more -- if we have industry come in with an operation like this, they would certainly be out there demanding a little bit better information to the public than what you people are providing. And I say that myself because I haven't had a chance to review that. And I don't think it's been out -- put out to the general public. And this operation that you're proposing, be it warranted for our national security, I think you know, I don't have a problem with that. I have a problem with the destruction with the environment. And I think everybody should have a little bit better knowledge of what's going here, so. And I think it	Prior to and during the development of the EIS/OEIS, the Navy contacted and consulted with numerous federal, state, and local agencies and representatives. For a complete listing, please see Appendix G “Public Participation”.

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		should be processed through the State also. And I haven't heard anything about the State being involved, so. Thank you.	
Linda Feiler 1		Sorry, Linda Feiler. Before I came I didn't know about the inert bombs that were going to be dropped, the missiles, the gun shells, the small arms, the pyro flares, the dyes, the expended materials, the hazardous materials. I didn't know a lot of it, and most of the community doesn't know a lot about it because like everything else, you come into the community, bang-o we have these meetings. Nobody ever gets their questions answered. If we have questions and we want them answered, that's why a lot of us come here. You know, because you're the ones who has the answers. I wanted to know how many pounds, how many bombs, how much toxic material is going into the water.	In compliance with NEPA, the Navy has chosen to implement a forum for comments to be made to foster a peaceful and non-confrontational setting for all involved. All public concerns and comments have been analyzed and addressed in the Final EIS/OEIS. The Final EIS/OEIS thoroughly analyzes the impacts of expended materials used during Navy training activities. As shown in Table 3.2-18 and 3.2-19, an estimated 352,000 lb (176 tons) of material would be expended during the training activities proposed under Alternative 2, with less than 3 percent of that material (about 5 tons) considered to be hazardous. Section 3.2 of the EIS/OEIS describes the impacts from the perspective of potentially hazardous materials such as explosives constituents. Section 3.3 describes the impacts of expended materials in terms of water and sediment quality. In addition, the existing discussion on the breakdown of hazardous materials in Environmental Consequences of Section 3.2.2, Expended Materials has been reviewed and, as appropriate, expanded. The analysis in the EIS/OEIS concludes that Expended and hazardous materials under the Proposed Action would not have a substantial effect on the marine environment.
Linda Feiler 2		You've done this for 40 year for 14 days, 40 years you've done it in various parts all over the United States. And I think most of us want to know where we call to get an answer because it's going to be in the newspaper. And we're going to have a dialog with ourselves through the radio station and we want to know where we call and where we get answers. Who's going to answer our questions before the 25th? MS. HIGHLAND: A phone number, that's what I want is a phone number. MS. FEILER: Yeah. A phone number, a name -- someone who's actually going to be there. And it probably should be 20 or 30 people there..... MS. FIELER: No. Because we already that. We already looked through the IRS [sic] and found out -- sitting with the expert here, that the answers were not in there. It doesn't say. I've asked all -- every single one of you already, how many, how many pounds, what are they made of, what are	Your request for a phone number is duly noted and multiple points of contacts were provided via many methods: the Federal Register, Navy Notice of Public Hearings, press releases, newspaper ads and articles, and in person at the public meetings.

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		the bombs made of? I want -- we what, I'm sure because I know there's at least 10 of us here who believe the same thing. We just want answers, that's all. And we want to know how we can get answers. And if we know that we're not going to be given answers, that is going to be highly publicized. So, please let us know who will answer any questions we have before the 25th. Thank you. MS. HIGHLAND: And a phone number.	
Brenda Dulma 2-1		I'm Brenda Dulma, very concerned citizen. I pick up this beautiful image of a sea anemone on the front cover. And I heard an amazing story at our museum the other day. We had a -- so my question is, what is the impact of this testing on the oceans invertebrates? The story I heard was in our own museum we had a sea anemone that hasn't opened up for four months because one fish is harassing it. So, if this is the response to an invertebrate in a very safe environment, that a fish is harassing it. What are the studies on all invertebrates with this kind of testing? So, my questions is, how are the invertebrates responding and other micro-organisms that we have no impact in this web of life? So, my question is, for my third time, what are the impacts on the invertebrates and micro-organisms in the ocean habitat from the testing? Thank you.	The Proposed Action includes no testing of new weapons, but rather the training of Navy personnel with established weapons systems. The Navy has conducted a thorough analysis of marine invertebrates in the EIS/OEIS, using the most current and best available science, as required by NEPA. The effects of underwater explosions on invertebrates are described in Section 3.5, Marine Plants and Invertebrates. Most expended materials are inert and dense and readily sink deep into existing sediments or become covered with sediment over time. These materials would also become encrusted by chemical processes or by marine organisms that further isolates them from the environment. Once deposited, the materials would not pose a hazard to benthic communities. Because high quality habitat occupies only a small portion of the benthic environment, there is a small potential for the communities to be affected by initial impact of expended materials. However, localized impacts to bottom-dwelling organisms could occur if struck but population level effects are not anticipated.
Whitney Lowe 2-1		My name is Whitney Lowe. And just a one other -- couple other things I want to add in addition to my earlier comments. I want to mention you know, it was brought up too that there's been a good bit of research done with seismic testing in some of the marine environments around here. And the oil companies have actually found that there's a possibility of residence for seismic testing up to 500 miles in some areas. And I know a lot of the focus has been on what's going on with certain marine mammals, such as the effects on whales.	Please see response to Elise Wolf 2-1.
Whitney Lowe 2-2		But the other thing I would ask you to really think about is that nobody is also taking about -- the whales aren't the only creatures in the ocean and we don't know how this might	Please see Sections 3.5 through 3.9 of the EIS/OEIS for the description and analysis of potential effects to all marine species. The Navy is aware of the diverse biological presence

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		effect sharks, fish, other animals that are not coming up and beaching themselves that are likely to be affected by this as well. So, while there's a lot study on certain marine mammals, like whales the very fact that we know this is killing a number of marine mammals, would ask us to think, maybe this is also having other damaging effects on other marine life that we really don't know about it. Is this really a good idea to engage in it. Thank you.	in the area and has conducted a thorough analysis of potential effects in Chapter 3 of the EIS/OEIS using the best available science as required by NEPA. Potential effects on all marine species have been discussed within the marine resources sections of Chapter 3.
Robert Highland 3-1		I just have to wonder you know, I was talking to everyone presenting and I think that we have come a long way. And that people just don't throw their trash in the ocean anymore they used to, hopefully. I think the Navy's probably come a long way, and they've hired scientists and they've hired environmentally conscientious people. But I still say, we are moving to fast at this point to just keep going. At some point the environmental impact has got to be totally important to each of us. And most important. So, I'm glad that there are better things happening all over the place. But I'm also worried -- what is your munition? What are you throwing into the ocean? I think I have a right to know. I mean is that a question of defense? Because if I know then some Arab might find out? To bad, I want to know what you're throwing in the ocean. And I have a right to know.	Please see response to Linda Feiler 1.
Robert Highland 3-2		What the difference between D-U and agent orange? Okay. That's it.	DU is the acronym for Depleted Uranium, which is the byproduct of enrichment of U-235. It is no longer used in munitions fired by Navy vessels. Agent Orange is the name for a herbicide and defoliant used by the U.S. during Vietnam and is not part of the proposed action.
Geneva Craig		[Ms. Craig was seated next to Ms. Feiler] Comments read by Linda Feiler: Okay. I'm speaking for Geneva Craig, who is 91 years old. And this is what she has to say: I believe in life. I do not believe in killing any living creature. The oceans are full of life. My reason for being a long time vegetarian is to avoid having any creature killed on my behalf. How could you practice bombing and not kill? I am strongly against any practice that will harm, stress, or kill in the ocean or on the land. I once supported the military because I believed it would prevent death. But now I have seen that we need to mend our ways and negotiate or learn ways to have peace. That was from Geneva Craig, who lives in Homer.....	This comment is duly noted.

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Linda Feiler 2-1		.....and my name is Linda Feiler, and I live in Anchor Point. Unfortunately my brother has brain cancer and I told him I was coming to the meeting, and he wished me luck and said, it's pathetic that we even have to comment on issues like this. I believe that we've done enough damage to our food sources and enough damage to our environment, enough damage to our seas and land. And that I don't believe that it's necessary for anyone to practice harming something else, killing our food sources, or killing our wildlife in the name of the military. If you need to kill in order to help us, what good does it do? Thank you very much.	This comment is duly noted.
Jaspar Kigar		My name is Jasper Kigar, I live and work in Homer, Alaska. I'm very impressed with the U.S. Navy's presentation and importance that they're placing on protecting marine animals. And I'm confident that the U.S. Navy is doing it's best to protect marine animals in the area in any of its activities. I understand after today that the U.S. Navy uses local fishing fleets and boat fleets in its war games as decoys and targets or for other purposes. And I would encourage the U.S. Navy to continue to use these fleets and to use more local Alaskan vessels in its activities in order to stimulate the local economy. Thank you	This comment is duly noted. The Navy strives to involve local entities when possible.

I.8.4 JUNEAU

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		Juneau	
Greg Brown 1		Okay. My name is Greg Brown. I have no military experience, but I am a licensed commercial pilot. I'm also a licensed boat captain. And I've operated a little bit in Alaska. Live here in Juneau. And although I'm opposed to this exercise -- I'm not comfortable at all with the analysis regarding the air pollution	Carbon footprint and air pollution concerns including greenhouse gas emissions have been discussed in Section 3.1, Air Quality and in Chapter 4, Cumulative Impacts.
Greg Brown 2		and the water pollution associated with it.	The Final EIS/OEIS thoroughly analyzes the impacts of expended materials used during Navy training activities. As shown in Table 3.2-18 and 3.2-19, an estimated 352,000 lb (176 tons) of material would be expended during the training activities proposed under Alternative 2, with less than 3 percent of that material (about 5 tons) considered to be hazardous. Section 3.2 of the EIS/OEIS describes the impacts from the perspective of potentially hazardous materials such as explosives constituents. Section 3.3 describes the impacts of expended materials in terms of water and sediment quality. In addition, the existing discussion on the breakdown of hazardous materials in Environmental Consequences of Section 3.2.2, Expended Materials has been reviewed and, as appropriate, expanded. The analysis in the EIS/OEIS concludes that Expended and hazardous materials under the Proposed Action would not have a substantial effect on the marine environment.
Greg Brown 3		My biggest issues is the Navy SONAR activity. I found it pretty questionable when I asked why this had to be done in one of the richest areas in the world for marine mammals and fish activity.	The purpose and need and the activities proposed are presented in Chapters 1 and 2 of the Final EIS/OEIS; See pages ES-9 and ES-10 for a summary. The complex bathymetric and oceanographic conditions, including a continental shelf, submarine canyons, numerous seamounts, and fresh water infusions from multiple sources, create a challenging environment in which to search for and detect submarines in ASW training activities. Please see Section 3.6 for sonar impacts on fish and 3.8 for sonar impacts on marine mammals.

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Greg Brown 4		And why it had to be done in May and June. And the response was, well for safety sake we -- that's the most calm weather for us to do that. And anybody -- all of us in Alaska, we go out in weather in November, December, and January. We seem to be able to get through it okay. So, I think that was a pretty -- that's not a very good comment in opinion.	In Section 2.3.2.3 of the Final EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further. Additionally, the season during which Navy training is proposed is during the April to October timeframe.
Greg Brown 5		I am very concerned about the whales. I make -- I do whale watching in addition to other activities here in Juneau. And I'm not at all comfortable that we really know what the effect of this -- the SONAR, this high intensity SONAR will do. Thank you very much for your comments and thank you very much for letting us make these comments.	Please see Section 3.8 of the Final EIS/OEIS for a discussion of sonar impacts to marine mammals. This analysis was completed in cooperation with the National Marine Fisheries Service, which is responsible for the protection of marine species. Please note that the Navy has conducted training using mid-frequency active sonar for decades in the Pacific ocean at training ranges in Southern California and Hawaii. There is no evidence of broad-scale impacts that are either injurious or of significant biological impact to marine mammals from those locations.
Lynn Wilbur 1		I'm Lynn Wilbur. I just want it on the record I came from Sitka. There's quite a few concerned folks over in Sitka as well, couldn't make it due to the short notice. I have quite a few concerns. Air quality is supposed to be 123 fold increase of emissions, including green house gas emissions. There's only going to be a 3000 foot window and then you're not going to consider. You think that these emissions, pollutants will disbursed through precipitation or dealt with.	Carbon footprint and air pollution concerns including greenhouse gas emissions have been discussed in Section 3.1, Air Quality and in Chapter 4, Cumulative Impacts. As indicated in Table 3.1-5 on page 3.1-12 of the DEIS/OEIS, air pollutant emissions under Alternative 2 would be 69 percent greater than under the No Action Alternative. Greenhouse gases are discussed in Chapter 4 of the Final EIS/OEIS. The 3,000-foot limit was only with regard to estimating ground-level air pollutant impacts, in accordance with USEPA recommendations. With regard to greenhouse gas emissions and other air quality issues, all air pollutant emissions from the Proposed Action are taken into account. Dispersal of air pollutants by atmospheric processes and scavenging of air pollutants by precipitation are well-established processes that must be considered in the air quality analysis.
Lynn Wilbur 2		No mitigation plan. I'm sorry, I support the no action alternative on that one.	As described in Sections 3.1.2.4 and 3.1.2.6, annual emissions of criteria and hazardous air pollutants produced by the Proposed Action are well below a level that could degrade regional air quality. Therefore, no mitigation measures are required to reduce the impacts on the environment of air emissions from the Preferred Alternative, Alternative 1 or the No Action Alternative.
Lynn Wilbur 3		Expended materials, the pollutants involved in that are heavy metals, tungsten, which is toxic to marine life.	Please see response to Greg Brown 2.

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		Fluoride compounds, which is toxic. One hundred and fifty times the safe level of hydrogen cyanide, these are all from bombs, and sonobuoys and other training materials	
Lynn Wilbur 4		also plastics. I'm hoping people are following the issue we're having in the ocean right now with plastics building up in gyre, and taking pretty much over the Pacific. That's a problem to me and I don't see that you've got much of a mitigation plan for that. I think you're 360 percent increase on that one, in your alternative two. So, I support the no action alternative on that as well.	The Navy is a seagoing force, which means that many of our environmental initiatives focus on ocean stewardship and seek opportunities to control our "ecological footprint" in relation to marine life, coastal impacts, and water quality. We have installed technology aboard our ships to keep plastics out of the ocean and safely manage our biodegradable waste stream. Shipboard waste-handling procedures governing the discharge of nonhazardous waste streams have been established for commercial and Navy vessels. These categories of wastes include solids (garbage) and liquids such as “black water” (sewage), “gray water” (water from deck drains, showers, dishwashers, laundries, etc.), and oily wastes (oil-water mixtures). See Section 3.3.1.2 of the FEIS/OEIS for further details.
Lynn Wilbur 5		On fish you agree that there's not a lot of studies done with sound. There's a lot of disagreement exactly on how to approach, using controls. You mentioned Grey literature, yet you reference your own documents, and letters, and impact statements invalidating your -- no basically not much of mitigation as far as fish are concerned. And I can go into more detail later, because I'm going to run out of time. But I'm going to support the no action alternative where fish are concerned.	There have been very few studies on the effects that human-generated sound may have on fish; these have been reviewed in a number of places (e.g., NRC, 1994, 2003; Popper 2003; Popper et al. 2004; Hastings and Popper 2005; Popper 2008), and some more recent experimental studies have provided additional insight into the issues. Many of these investigations such as Gray literature (non peer-reviewed reports) have not been used for analysis due to critical reviews of this material. No additional mitigation measures are proposed or warranted because no significant effects on fish or fish habitats have been identified.
Lynn Wilbur 6		And marine mammals, this is probably where it's going to hit home for a lot of people. I too, am concerned about SONAR. Beaked whales are the most vulnerable because they're deep divers. And in the Bahamas in 2000 there were some expert witnesses that can attest to what happened there.	The Navy conducted a thorough analysis of sonar and at sea explosions in Section 3.8 of the Final EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. The Navy’s analysis indicates there is little relative risk to populations of marine mammals from sonar training exercises. The Navy’s protective measures are effective at mitigating, not eliminating, risk to marine mammals. Therefore, mitigation and monitoring are implemented to further reduce impacts. Also, note that the U.S. Navy has conducted active sonar activities for decades at the training ranges in Southern California and Hawaii with no

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			indications of broad-scale impacts that cause adverse biological impact to marine mammal population stocks at those locations. Because there is no indication from areas where the Navy routinely trains that training activities have a negative impact on the health of the marine environment, the Navy is confident that there is little relative risk to marine mammal populations from active sonar training or any other training events. Please see Appendix F, Cetacean Stranding Report, for additional information regarding whale stranding and a discussion regarding the circumstances surrounding the Bahamas incident. The Bahamas incident is specifically discussed in Section F.1.6.1. In addition, there is new evidence from controlled exposure experiments on beaked whales in the Bahamas documenting that beaked whale exposure to mid frequency sonar is not, in all cases and maybe most cases, going to result in strandings or injury to those animals (Tyack 2009).
Lynn Wilbur 7		I just don't think that in the Gulf of Alaska your Beaufort 3 conditions are going to be not be really good for spotting whales. Whale experts have made the comments that you really can't spot whales very well in anything over a Beaufort 1 in the Gulf of Alaska. So, the use of onboard spotters, and you mentioned maybe possibility aerial craft if the conditions are right and if they have time, is how I interrupted your mitigation on that. I just don't think that's suffice. So, again I'm supporting the no action alternative.	Please see Chapter 5 for a discussion of the Navy's proposed mitigation measures. While the Navy is very confident in its well-trained lookouts' ability to detect marine mammals at the surface in reasonable conditions, it does not expect that 100% of the animals present in the vicinity of training events will be detected visually by lookouts aboard ships, in aircraft, or by passive acoustics in all cases. One of the primary jobs of Navy lookouts is to detect and report on any anomalies in the water and therefore their purpose and training is very different from that of biologists and they are positioned with a height of eye above that of most research and fishing vessels. While Navy lookouts are not expected to identify marine mammals to the species level as some biologists could, it is not a necessary component for implementation of the mitigation measures (except for the case of bow-riding dolphins). Additionally, effective training in the TMAA dictates that ship, submarine, and aircraft participants utilize their sensors to their optimum capabilities as required by the mission, which increases the detectability of whales in the vicinity of training activities.
Lynn Wilbur 8		It seems like you've dismissed a lot of recommended mitigation's. You've got a series of them, you've got a lot of them you've dismissed. Including recommendations from NOAA. And I can go into that in a little more detail if we get	Please see Chapter 5 for all mitigation measures that have been implemented and Section 5.2.1.6 which discusses all alternatives that have been considered but eliminated for implementation. Additionally, please note that the U.S. Navy,

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		to a second round. But I'm running out of time. So, again I support the no action alternative. Thank you.	in conjunction with NMFS and USFWS, are best suited to determine what mitigation it can effectively use during its training and testing activities to mitigate harm to marine mammals while still being able to meet its operational needs to train for real-world conditions it may face. Both the Navy and NMFS agree that no significant harm to marine mammal species will result from the Navy's proposed activities. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Alex Simon 1		Thanks for the opportunity to speak. So my name is Alex Simon. I did have a chance to speak with some of you before and one of the things that impressed me, you seemed like well intentioned individuals. I think the reason why I'm supporting the no action alternative. Well there's several reasons. But one of the things, if we look at the history of the military in the United States, there's a long history of very well intentioned people concerned with national defense. Implementing programs that result in long term environmental health. And so, before I lived in Alaska I lived in Utah. And some of you might be familiar with down winders. These are victims of above ground atomic testing in the 1950's. And so there's still people alive today who -- and I've met many of these individuals, who suffer from cancers and other effects. And I think you know, if you look back then we were facing you know, the Soviet Union. An adversary that was using weapons that were pretty much comparable to what we had, as far as technology. And that -- I think that was a case of well intentioned individuals, very concerned about national defense, like yourselves. And I worry about those mistakes being repeated. Particularly, back then we were dealing with concerns of human life. I assume the bar is set lower for your concerns about marine life.	This comment is duly noted.
Alex Simon 2		A second point is I think that geo-politics have changed substantially since then. Military realities that we're facing, really our main adversary at this point at least, I realize there are potential for others to come along. But, is Al-Queda, Al-Queda doesn't have a Navy. That -- none of our adversary's really have advanced Navy's. You know, I mean if we look	This comment is duly noted.

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		at you know, Iran, et cetera. That we're spending as much now on the Military as all the nations combined. I really, I know, the case could be made better back in the 1950's that it was critical that such tests be conducted. I don't really think this is critical for national defense.	
Alex Simon 3		A third point that I would like to make. If we look at the local fisheries. There's many thing --unfortunately whether or not this testing is done, the fisheries, the aquatic life, they're already under a lot of stress. And so locally, of course the lands rising faster than the oceans, is that many of the local salmon runs apparently go extinct due to global warming. That there's already all kinds of problems. I think to step in and exacerbate those problems seems unwise. Okay. That's all I have to say. Thank you for your time and consideration.	As detailed in Section 3.6, the Navy is very aware of concerns from fishing fleets and fisheries in the Gulf of Alaska. As described in the EIS/OEIS, the Navy is confident that its training activities will not impact fisheries, fish populations, or the livelihood of fishermen in the Gulf of Alaska. Socioeconomic impacts in regard to the fishing industry have been analyzed in the EIS/OEIS in Section 3.12 - Socioeconomics.
Andrea Doll 1		Well thank you -- thank you for giving me the opportunity. I am not a member of the military, although I've been a military dependent wife for over 30 years. My husband was a DESERON Commander that did exercises in the Gulf for as long as I can remember. And then I had the opportunity to serve the public as a legislator and was on the Military Affairs Committee.	This comment is duly noted.
Andrea Doll 2		So, I'm very interested in what's going on here tonight. And my suspicion is that this huge military machine is moving forward and it's going to take an awful lot to stop it. We have been in that no action alternative for some time, not using SONAR up here. But now the Navy wishes to go not only to one, but they want to go to two. And I am not quite sure just what kind of testimony you're going to hear tonight that will change this machine that's moving forward, to stop that moving and go back to the no action alternative. I am very interested in hearing comments on that from the military and to see exactly what kind of effect this will have -- our testimony here tonight, on you. I think that is fairly much what I wanted to say on this.	This comment is duly noted. The decision on which alternative to pursue will be considered by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Andrea Doll 3		I did want to point out that while I was in the Capital I was mailed those circular things that you turn around and you can see what kind of whale you're looking at. When you tell me that the Navy is going to be trained on these watches, where they stand on the destroyer and they look out and they see some movement, and then twirl that little card around and say, I want to get to -- let me get to the control	The "circular things" that you refer to are called "whale wheels" and are more or less a public outreach tool rather than a training device. A full discussion of the actual mitigation measures is presented in Chapter 5 and does not involve use of the whale wheel. Please note that Navy lookouts undergo extensive training to include on-the job instruction under supervision of an experienced lookout followed by completion

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		tower here and talk to you about this -- you know, I mean it's really pretty laughable actually.	of Personnel Qualification Standard Program and the NMFS-approved Marine Species Awareness Training.
Andrea Doll 4		So, I am hoping that by this testimony you will be able to show us what areas we will be able to have a real effect on when you start these exercises. I know there are some things the Navy must do, they have to do. And there's no give or take. But there are areas that there are give and take. How can we effect those areas, how can we really have that impact? That is what I would like to know and would like to get some kind of response on. Thank you very much.	This comment is duly noted. Please note that all public comments and concerns on the training activities and the EIS/OEIS document itself are equally weighted under the Navy NEPA process, and are all taken into consideration by Navy decision makers in the preparation of the Final EIS/OEIS document.
Jan Crichton 1		Hi. Alaska already has a long standing problem and history.....a pretty long standing problem with leftovers from the military. All kinds of health and environmental issues where the military has been real eager to go in and do exciting new things. And then left and dumped problems and toxins for future decades to have to deal with. And the cost has been really high to all of us.	Please see response to Lynn Wilbur - 4.
Jan Crichton 2		Also, Alaska is one of the last places that has a really viable, healthy marine mammal population. But they're stressed our. They're going to start experiencing problems, some of them already are. The pinipeds and marine mammals are already going down in population, and we don't even know why. I think it's unwise to start shooting off active SONAR in their home waters.	Please see response above to Greg Brown 5. In addition, please note that sonar use outside the Navy is common in the Gulf of Alaska including, for example, fathometers, fish-finders, and NOAA research involving acoustic trawl surveys for fishery resources.
Jan Crichton 3		Especially during the summer months, which are very critical to them for feeding and everything. We have a short summer, they need that. They need to be uninterrupted. I would have to support the no action alternative simply because it does not include any active SONAR, and that's the thing that concerns me the most. We know that it has already caused problems off California and I don't think the negative impacts that have been happening there have even been researched. It's not a time for us to turn around and start doing this in Alaska waters. I think the problem of potential impacts on marine mammals is not acceptable or reasonable given the perceived need to these repeated active SONAR exercises when I don't really see any good reason to do it. That's basically it.	Your support of the No Action Alternative is noted, however, it is incorrect that there have been “problems” (“negative impacts”) resulting from sonar use in California since there have been no stranding incidents or other indications of impact to marine mammals or other marine life over decades of sonar use history at the Southern California Range Complex. Please see Chapters 1 and 2 of the Final EIS/OEIS for the reasons why this training is essential. With regard to sonar and at sea explosions, please refer to response in Lynn Wilbur 6.
Mark Anderson 1		Yeah. My name is Mark Anderson and I am also in support of the no action alternative. I find the analysis has	Your support of the No Action Alternative is noted. Federal mandates include provisions of NEPA and Sections 106 and

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		overlooked, and I think made some incorrect conclusions. Cultural resources, native people, and actually all people of Alaska consider our wildlife a cultural resource. So, I think if you are having an effect on wildlife you are effecting cultural resources.	110 of the National Historic Preservation Act (NHPA) and their implementing regulations at 40 Code of Federal Regulations (C.F.R.) 1500 and 36 C.F.R. 800, respectively. As described in Section 3.10 and as required in these regulations, the Navy has complied with the requirements for using the NEPA process to achieve Section 106 compliance. Groups that have been formally notified about the project include affected Alaska Native tribes and the Alaska SHPO. As stated in Section 3.10.1.5, on 18 May, 2010, the Alaska SHPO signed a letter indicating concurrence with the Navy's analysis that the Proposed Action would not affect submerged cultural resources (see correspondence in Appendix C). The Navy also has undertaken public involvement activities throughout development of this EIS/OEIS.
Mark Anderson 2		Socioeconomics, a large developing industry in Alaska is marine mammal observation.	Socioeconomic impacts have been analyzed in the EIS/OEIS in Section 3.12, Socioeconomics. Please note that the proposed activities will take place in the Temporary Maritime Activities Area far out to sea which is not a location where whale watching generally occurs. Please also see Chapter 3 of the EIS/OEIS for the description and analysis and potential effects. Specifically, analysis to marine life in Sections 3.5 through 3.9. Because the Navy has no exclusive "right of way" when conducting training activities on the ocean, Navy ships and aircraft intentionally seek areas clear of all other vessel traffic, thereby reducing the likelihood of negatively affecting fishing and tourism industries.
Mark Anderson 3		Also, bird observation. I don't think you've done a good enough analysis on effects to birds, of which there are millions and millions of sea birds out there in this area at this time. May and June is a critical time for them. A lot of them have flown from the Southern Hemisphere to get here. We have very large migration routes and if something upsets them along the migration route. We've been having some serious problems.	Section 3.9 of the Final EIS/OEIS provides a thorough analysis of potential impacts to birds, including migratory birds as mentioned in your comment. This analysis concluded that the Navy's activities would have no significant impacts to migratory birds.
Mark Anderson 4		I don't think you've done enough research on what happens to fish. Most fish have an air bladder that is going to be negatively affected by a sound blast. We know that sound does have an effect of fish, and I don't think you've actually studied that enough to know what is going to happen to the fish. Alaska has a long history of cooperative management between the State and the Federal government. And that's	Please see Section 3.6.2.2 and 3.6.2.3 with regard to an analysis of potential impacts on fish, including a review of research involving the potential to affect the air bladder in fish from exposure to sound. Section 3.6.2.4 presents the most recent science available on effects of SONAR on fish. The limited information currently available suggests that populations of fish are unlikely to be affected by the projected

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		why we still do have marine mammals and fish here. But, they are stressed.	rates and areas of use of military sonar. Most fish species would be able to detect mid-frequency sonar at the lower end of its range. Short-term behavioral responses such as startle and avoidance may occur, but are not likely to adversely affect indigenous fish communities.
Mark Anderson 5		We have several endangered species that we're talking about here. And I think that the Endangered Species Act has been really overlooked in your analysis as well.	All ESA species have been included and analyzed in the Final EIS/OEIS in Sections 3.5 through 3.9. Additionally, the U.S. Navy is engaged in consultation with the USFWS and NMFS under the Endangered Species Act. The USFWS has concurred with the Navy's analysis of species under their jurisdiction, concurred with the Navy's "may affect, not likely to adversely affect" determination.
Mark Anderson 6		I guess that's really all the comments I have. I think -- I'm not sure you're going to hear a lot of people supporting alternative one or two here tonight. I think that the current level of operations in Alaska is acceptable. And I think you may just be moving to Alaska because you think that you can get it done -- you can do it here where you've had quite a bit of public opposition to doing it down south and in other areas where you've tried this before. So, those are my comments. Thank you.	Your support of the No Action Alternative is noted. As explained in Section 1.4 of the Draft and Final EIS/OEIS, the decision on which alternative the Navy will pursue will be made in light of the Purpose and Need by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process. The Navy has not been blocked from training with active sonar in any areas of the ocean and is seeking to continue joint training in the waters of the proposed TMAA because an alternate location for Navy training in the ATA that meets the purpose of and need for the Proposed Action does not exist. The proposed area for Navy training in the TMAA is based on the mission of Alaska Command to support the needs of military forces within Alaska and forces deploying through Alaska.
Victoria Dance 1		Victoria Dance. And I'm wondering if this process is genuine in it's intent. Because I know that you went through the process in -- or the Navy went through the process in Southern California when you used the SONAR. And there was a protest, and one of the outcomes of that protest was a lawsuit that banned the use of the SONAR. But then the courts lifted the ban, and they went ahead -- the Navy went ahead and used the SONAR that they're wanting to use up here. That was in August. Two weeks later three great blue whales were reported as floating dead in that area, the	The U.S. Supreme Court upheld the Navy's continued use of sonar during training activities in the Southern California Range Complex last year. These activities have been occurring for decades in that location and the EIS/OEIS was developed (in part) so Navy could seek authorization under the Marine Mammal Protection Act and Endangered Species Act for the continuance of those activities. The necropsy on the 3 blue whales referenced were found to be victims of ship strikes in the commercial shipping channels and not related to SONAR activities. The Biological Opinion

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		localized area. And then October 2nd another was found dead off of Big Sir. And then another washed on shore in Fort Bragg.	prepared by the National Marine Fisheries Service for the Southern California Range Complex indicated that in the event blue whales are exposed to mid-frequency sonar, they are not likely to hear those mid-frequency sounds since their hearing is centered on lower frequency sound (see http://www.nmfs.noaa.gov/pr/pdfs/permits/socal_biop.pdf; page 204).
Victoria Dance 2		So, when there's talk about protective measures and those protective measures being to localize. What we see in -- and of course we can't prove, that those whales were damaged by the SONAR. But there's a migration pattern you know, how can you localize it? I mean you can really localize it. So, that as a protective measure, I don't think that's realistic.	Over decades of sonar use in California there have been no stranding incidents or other indications of impact to marine mammals or other marine life over decades of sonar use history at the Southern California Range Complex. For further information on the analysis of sonar, please see response to Lynn Wilbur 6.
Victoria Dance 3		And then the other protective measure mentioned was about minimal impact. So, I guess I'd want to know what the definition of minimal is, because those are three -- those were instances that became visible. But the unfortunate thing about the ocean is that there's so much that is invisible. And that was referred to very nicely by some previous comments about what we can see that has happened in the Navy's training to birds, and environment, above -- in the air.	Please see response above to Lynn Wilbur 7.
Victoria Dance 4		And so, I'd have to say I question the genuine intent of the Navy stewarding the environment. And I'm really kind of offended that you use it. I'm questioning this process that feels like a charade when we see what happened in Southern California. And I forget the fellows name who mentioned that he felt like it was -- or Jan -- well, I'm sorry that I can refer back to some wonderful comments. But I can refer to Andrea's suspicion that this is a machine that is going to be difficult to stop. And then also, Jan's comment on not enough adequate research. It's only been a year since these events happened in Southern California. And here you're wanting to go again without really understanding what you're doing. Thank you very much.	The Navy provides reports to NMFS as part of the MMPA permit and those reports are available to the public via NMFS's website. Please note that monitoring reports from exercises since 2006 have demonstrated the ability to detect marine mammals, the success of these mitigation measures, and a lack of observable impacts to marine species as a result of Navy training events. (Please see the recent results supporting this as presented in training ranges monitoring reports "Marine Mammal Monitoring for the U.S. Navy's Hawaii Range Complex (HRC) and Southern California Range Complex (SOCAL)" available at [http://www.nmfs.noaa.gov/pr/pdfs/permits/hrc_socal_report.pdf]). An integrated monitoring plan for the activities in the TMAA is also planned as presented in Section 5.2.1.4 of the EIS/OEIS.
James Voelckers 1		Hello, my name is James Voelckers. Thank you for the opportunity to speak. I want to express my gratitude first off to the Navy for keeping us well defended, and other military institutions. However, I believe there are a number of points	Please see Chapters 1 and 2 for a discussion of the purpose and need. Specifically, Section 2.2.2 details why training with sonar is required.

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		that they have not considered or that are getting overlooked. You mentioned realistic training a number of times. Yet, as was brought up before we don't really have any enemies with naval capabilities. It seems like the terrorists certainly don't. So that leaves China or Russia. With the proliferation of spy satellites it seems very unlikely that they would be able to attack us with any sort of sizable surface craft, which brings me to submarine detection. Which is what I think many of us are here for, with the SONAR, active SONAR. That seems like -- the only use for it if we know that they're there. And if we know that they're there, then I mean, they're not doing what submarines are supposed to do. Which is, I believe initiate a first strike. There are way to few ships to prevent such a first strike, so this seem to me to be a moot point. We can find them if we know they're there.	
James Voelckers 2		Secondly, I would wonder why exactly why we are doing this here. This was just brought up, it happened in California, to much public outcry. Which is why I think perhaps, you'll try here for a lighter population density so, less protest. However, Alaskan waters are some of the most -- most fertile in the entire world. Especially this area which is very pristine. And as you said, that you were only going to be doing this in the summer months, that that's when I believe most marine mammals are feeding in these fertile waters. They go to Hawaii, I believe in the winter. So, why would our enemies, if we have them, be they China or Russia, not attack us in the winter when you haven't trained, or during a storm. It seems like it's a sunny day situation to be running a lot of naval exercises on sunny days and good weather in the Gulf. Whereas, if somebody actually did have harmful intent, it seems like they would want to hit us when a, we could be least likely to respond. So, I would question why you were not using the winter weather to be fully prepared and fully trained.	Please see Section 2.3.2.3, describing why the Navy considered but rejected an alternative timeframe such as holding the training in the winter. Additionally, please see response to second part of Mark Anderson 6.
James Voelckers 3		And so in conclusion, I believe I would ask that some of these activities could not be carried out instead in the deep waters of perhaps the Hawaiian coast or other Pacific where they wouldn't, as adversely effect the ocean. I realize you will probably do whatever you have to do. Which is your job. But here perhaps is not the best location. Thank you.	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action.

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Tina Brown 1		I'm Tina Brown. I support the no action alternative also. The other alternatives pose to many air and sea pollution problems.	Your support of the No Action Alternative is noted.
Tina Brown 2		And the Navy SONAR testing endangers marine wildlife. We've listed birds, fish, turtles, whales of course, all marine mammals. Not even the Navy knows all of the behavioral and physiological effects of SONAR testing on marine life. Clearly the Navy needs to train.	There is no testing of sonar proposed. The proposed activities include use of active sonar and other sensors during anti-submarine warfare training. Please see Chapter 2 for a description of the proposed activities.
Tina Brown 3		But choosing some of the most prolific marine wildlife areas in the United States, if not the world, particularly at a time when migrating marine life is there is irresponsible. This is not the place to practice. And the time you chose is not the time to practice there. Not the place and not the time. Thank you.	In Section 2.3.2.3 of the Final EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further.
Dixie Belcher 1		My name is Dixie Belcher, I'm with Turning the Tides in Juneau. Turning the Tides raises awareness about what is happening to the ocean and the effect it has on human health. I want to speak especially to the 360 degree increase in water pollution	Impacts on water resources under each of the alternatives would be below thresholds that could result in long-term degradation of water resources or affect water quality. Please see section 3.3 for a full analysis of water quality.
Dixie Belcher 2		and the 123 fold increase in air pollution.	Air pollutant emissions from training activities would be released to the environment in a remote area with good circulation and few other existing sources of air pollutants. Training emissions would be rapidly dispersed over a large ocean area where few if any individuals would be exposed to them. Residual air pollutant effects during the large portion of the year when training was not being conducted would be negligible. Based on the estimated levels of air pollutant emissions presented in Table 3.1-5, no substantial air pollutant effects are expected under any alternatives. Also, please see response to Lynn Wilbur - 1.
Dixie Belcher 3		The ocean is 71 percent of our planet. It provides food, and according to Dr. Sylvia Earle, up to 85 percent of the worlds oxygen. We cannot live without the ocean. We have dumped millions of tons of poisons, chemicals, radioactive waste, and other garbage into the ocean. Some whales and other sea mammals can now be legally classified as toxic dumps. We have thousands of dead zones where nothing grows. The largest 1000's of square miles. We are finding fish with cancer. What are we thinking? The ocean is in fragile health. Ocean scientists often refer to their work now as, documenting the decline. If we are to survive we must	This comment is duly noted. Please note that ocean dumping in general and the dumping of hazardous materials at sea is not conducted by Navy ships. Please see Section 3.2.1.2.

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		stop contributing to the demise of the ocean. We must stop using the sea's and the life within them as toxic dumps to do with as we please. I believe the greatest threat to the United States and to the planet is irretrievably damaged ocean.	
Dixie Belcher 4		Please consider if SONAR testing and military dumping are contributing to the health of the ocean or furthering its demise. If it's impossible to stop SONAR and additional poisoning of air and water from military exercises, please use the no action alternative. Thank you.	The Navy is aware of the diverse biological presence in the area and has conducted a thorough analysis of potential sonar and air/water pollution effects in Chapter 3 of the Final EIS/OEIS. The Navy does not dump toxic pollutants into the oceans. With regard to sonar, please see response to Lynn Wilbur 6. Your support of the No Action Alternative is noted.
Frank Bergstrom		Gentlemen, lady I would -- I've got very brief comments here. Not particularly well prepared for them. But it's surprising to say, I would like to thank the Navy for fulfilling its mission. I would like to thank you for training for that mission. I would like to thank you for training all the young sailors and aviators, daughters and sons that come from our communities to join the Navy to protect this country. You do a great job. And I appreciate it very much. I would like to thank you for a careful analysis of this issue. I can't think of another nations military in the world that would go to such efforts to do their job and to take care of the environment at the same time. I would like to thank you for coming to Alaska to fulfill that mission. I would only ask that when you do, you might stop into Juneau, buy some gas, get a burger or two, and spend some time. Thank you very much. [MR. MICHAELSON: Mr. Bergstrom, I just need to ask you -- if you could just say your name for the record.] MR. BERGSTROM: My name is Frank Bergstrom from Juneau.	This comment is duly noted.
Henry Larsen		Gunalcheesh. Ya'x gu 'oo, my English name is Henry Larsen, L-a-r-s-e-n. I too am opposed to against the -- what was that? (Mr. Larsen conferred with Ms. Wilbur) I too support the no action alternative. I think you need to -- the Navy needs to do more studies on the fish and the marine life you know, too. I think they need to do that because, I was talking to somebody earlier, and I too am a captain. I have a 200 ton license. And I've traveled from Sitka to Seward and I've seen fur seal -- fur seal and sea otter 22 hours offshore. And that's in that yellow area you guys were thinking about testing. That's all I have to say. Thank you.	Your support of the No Action Alternative is noted. Please see Sections 3.5 through 3.8 of the Final EIS/OEIS with regard to marine life and specifically 3.7 with regard to a review of the available studies involving fish. As presented in Section 3.8.5.4, Navy is aware of the possible presence of fur seals in the Temporary Maritime Activities Area (TMAA). With regard to the sea otter located far offshore and potentially in the TMAA, all available published information indicates that sea otters normally remain near-shore as presented in Section 3.8.1, although at another public hearing location, the Navy heard a similar yet off-the-record account of a sea otter interacting with a fishing boat located far out to sea. The

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			potential use of or migration through offshore areas by sea otters would be interesting future research to attempt to determine if these two reported sightings were anomalies or if they reflect a normal yet previously unknown and rare portion of the sea otter range in the Gulf of Alaska. In the interim, the analysis of impacts to the sea otter in the EIS/OEIS will remain based on the best available science indicating that the sea otter should not be in the TMAA during the proposed training events.
Murray Walsh		Murray Walsh. I would extend my compli -- first of all welcome to Juneau. I guess I don't think anybody's said that to you yet. You may not feel all that welcome right now. But I should say that people who do get up and speak in setting like this show a little more courage than those that don't. And I have to admire that even if I disagree with almost everything I heard. But if you want a test a public speaking, go back to 1974 when the Navy was not doing any of this kind of environment work. I was an employee of the State of Washington, and I had to be the one to tell the Admiral there in Seattle that before they could build the Bangor Submarine Base, they were going to have to talk to the State of Washington first. You talk about public speaking. I guess I'd offer a little perspective. The actual amount of activity that the Navy is proposing to do in the Gulf is insignificant compared to the other human maritime activity that is already there. You've got a season coming where you're going to be operating at the no action alternative. Maybe make some notes about what happened, how many times you did change an exercise because you saw whale or whatever it is. And come back and tell us about that. Then go a head and go to alternative two and keep track of it. And reevaluate -- if you are killing whales right and left, then it's time to go back to something else. But we don't even know. And so -- and this is a decision that you get to make every year. So, it's important to pay attention to the environmental matters. I admire you for doing it. And Al-Queda does have a Navy. It's housed in Iran right now and North Korea. Those countries both use the Kilo submarine, the quietest submersible fighting ship in the world. Yeah, I want you guys to be able to find them. Thanks.	Please see response to Victoria Dance 4.

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Dan Holt 1		Thanks for coming. My name is Dan Holt. I applaud you guys for coming and actually doing this. Because most of the time, as far as the military is concerned we hear about it afterwards, after it's done. So, this is great that we have this ability to comment. And I guess if -- if it's true that the SONAR is actually killing off whales, such as the one lady said -- gave a good illustration about Southern California.	This comment is duly noted. Please see response above to Greg Brown 5.
Dan Holt 2		Then I think that's a good idea to do the -- to oppose it. But otherwise, I'm all for alternative one. Getting in there and learning more and keeping our best interest at heart, and keeping on the cutting edge of research and development.	This comment is duly noted.
Dan Holt 3		That being said, I'm also with the Civil Air Patrol here in Juneau, Alaska. And I wondering if there's any way our group, as far as the Civil Air Patrol can help out with your exercise, so. And I've actually put that on my card. Thanks.	The proposed action does not necessitate the use of the CAP but thank you for your offer.
Lynn Wilber 2-1		I'm Lynn Wilber. I've heard some interesting comments. One of the things that I wanted to fit into my comment was the left over materials from the military. Anybody who's hiked around Sitka knows that we step in stuff from World War II all the time. Bins of oil, weird liquids, I have no idea what they are. And its been a tradition of the military to not deal with the mess that they've made. I appreciate our military, I really do. I appreciate the work you do. And I appreciate that you're training and preparing. But the lack of a mitigation plan is just astounding to me. And the overwhelming opposition you've received in every training range, it doesn't seem that you've taken these public comments to heart.	Clearly the way refuse was disposed of during WWII is very different than is standard practices today over 65 years later. Please see Chapter 5.0 of the Final EIS/OEIS, Mitigation Measures, which presents the U.S. Navy's procedures for dealing with oily waste, hazardous materials and discharges.
Lynn Wilber 2-2		One other thing I want to make clear is the Navy is undergoing or going through the NEPA process because they were court ordered to. They were taken to court and the court ordered you to do this. So they've been training, in fact the Atlantic Fleet Training Range is operating on a no action alternative, which is similar. There are other alternatives -- toning down the exercises and not using SONAR. And they did that and they didn't go through the process, from my understanding from reading the news and following the time line. There's a lot of information, available congressional reports, things on the internet that you can read. I like to enter into these types of debates with an objective mind. And I've heard other people who are -- whether they're experts, whale biologists, scientists, ex-	Please see Chapters 1 and 2 with regard to the purpose and need for undertaking this environmental analysis. This EIS/OEIS is not being prepared pursuant to any litigation or court order. Navy has taken a programmatic approach to the GOA EIS/OEIS in accordance with the Secretary of Navy's At-Sea Policy of 28 December 2000 directing Fleet commanders to develop programmatic approaches to environmental compliance for ranges and operating areas.

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		military say that they wanted to go into this objectively.	
Lynn Wilber 2-3		And just couldn't because of the gross negligence, the lack of mitigation. Some of the measures that have been recommended to you for decreasing the chance of harassments or takes on marine mammals have been dismissed. I'd said I was going to try to get back to that. You talk about in the impact statement, you talk about an unusual stranding event. Where NMFS gets involved and tries to recover if there's a dead animal or a mass stranding. They apparently don't have and nor do you have in place yet a stranding response or communication response. And I'm sorry, I actually thought I had a little more time than the three minutes. But this is just not acceptable. Thanks again.	Please refer to chapter 5 of the Final EIS/OEIS which presents the US Navy's protective measures, outlining steps that would be implemented to protect marine mammals and Federally listed species during training events. Please also Section 5.2.1.6 which discusses mitigation measures that have been considered but eliminated for implementation. Please see Section 5.2.1.5 regarding the Stranding Response Plan for Navy training events in the Gulf of Alaska.
Mark Anderson 2		Yeah. This is Mark Anderson. I guess the thing that occurred to me as I was sitting and listening to some other comments is, you have three alternatives here. And I don't think that is a reasonable amount of alternatives to really have. I think there are a number of others. You don't have any alternatives that have increased science, increased -- you don't even mention any alternatives where you would be doing some studies before you actually go do your testing. So, I think that you need to go back to the draft EIS and develop some more alternatives that do take into account more scientific study, a slower approach. You may be able to get to a higher alternative in your mind by actually doing these things first. Otherwise, I think you're probably going to be running into another problem with litigation. Thanks.	See Section 2.3.2 regarding other alternatives considered but eliminated resulting in the three alternatives carried forward in the document. Please be aware that there is no “testing” proposed in any of the alternatives. As presented in Chapter 2, the Navy is proposing to conduct Navy training activities, which does not involve testing of untried systems or devices.
Tina Brown 2		I'm Tina Brown again. And I just want emphasize the obvious. Once an animal is dead, it's dead. And going back to see why it died doesn't bring it back to life.	This comment is duly noted.

I.8.5 CORDOVA

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Rosemary McGuire 1		Okay. Sorry to call you guys all back like this. I sort of didn't quite understand how this was going to work out. But I do think it was important that we all get a chance to hear some of what, we as a community -- some our concerns might be. Personally, I listened carefully and looked at the posters and stuff like that. It seems to me that there is a good deal of uncertainty about why, when, and how often marine mammals such as whales are impacted by SONAR. But it's very clear that it does sometimes cause mass strandings and it can cause mortalities. And it seems to me that since we don't know why, we ought to be very careful about using it. I would prefer not to have active SONAR used in the Gulf of Alaska.	Please be aware that sonar use outside the Navy is common in the Gulf of Alaska including, for example, fathometers, fish-finders, and NOAA research involving acoustic trawl surveys for fishery resources. Regarding the uncertainty with regard to Navy use of sonar during training, the Navy has been conducting active sonar activities at the training ranges in Southern California and Hawaii with no indications of broad-scale impacts that are either injurious or of significant biological impact to marine mammals and other species for decades. Therefore, it is not likely that any additional risk posed by the proposed activities will have any significant impact on species in the TMAA.
Rosemary McGuire 2		Our livelihoods do depend on having a working ecosystem out there. And I'd really appreciate it if you guys would consider going with the same level of activity that you're doing now, which does not include active SONAR. So, thank you for your time.	The Navy's analysis demonstrates there is little relative risk to marine life from sonar use as proposed in the EIS/OEIS. Additionally, as explained in Section 1.4 of the EIS/OEIS, the decision on which alternative the Navy will pursue will be made in light of the Purpose and Need by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.
Charles Weaverling 1		My name is Charles Weaverling. I'm the former mayor of Cordova. I organized and operated the wildlife rescue fleet during the EXXON VALDEZ oil spill, and I'm a former Navy submariner. Qualified in diesel electric and FBM's. I'm very concerned about this proposed increase in training activity. And I'm not reassured by the posters and the comments I've seen here tonight. I do not think that it would be a positive impact on wildlife and fisheries to increase the training. I don't think it's a positive impact given the training that's used now. But active SONAR, especially the newer SONAR's that are available, are certainly more effective than SONAR's that were used in the past. I don't think it would be a neutral impact on the wildlife and the fishery.	Please see the response to McGuire-1 above. In addition, please be aware that the basic sonar systems proposed for use in the Gulf of Alaska have been in use in use since the 1970's. While the processing of the received sonar echo has improved due to the increase in computing power, the output of sound into the water from the system has remained basically the same.
Charles Weaverling 2		This area has not yet recovered from the EXXON VALDEZ oil spill. I think it would be a negative impact on the fishery, the marine mammals, and the wildlife in the proposed area.	Please see Figure ES-1 for the location of the area where the proposed activities will occur. While it is understood that marine life is seldom restricted to a single area, none of the proposed activities will take place in or around Prince William Sound or coastal areas directly impacted by the Exxon Valdez

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Cordova			
			oil spill. For the area where the training activities will occur, Chapter 4 presents the cumulative impacts analysis addressing the environmental impacts that result from the incremental impact of Navy activities when added to the past, present, or reasonably foreseeable future actions that affect the same resources. Table 4-1 succinctly depicts the categories of past, present, and reasonably foreseeable future actions that affect cetacean populations. Identifying such activities and in fact comparing them for relative impacts is an appropriate approach to cumulative impacts analysis. The Final EIS/OEIS analyzes in detail the effects of Navy actions on specific resources, and places those in the context of other sources of impacts.
Charles Weaverling 3		This is a very rich biological area. And we depend on a healthy marine environment for our livelihood here. Activity in the wintertime, though I'm not a biologist, I understand is less productive during -- is less productive for -- is less used by marine mammals and fish during the wintertime. But even given that, basically I would prefer to see the level stay at it's current level or reduced. Thank you very much. I'd be happy to answer any questions, but I guess this is not a discussion. Thank you.	In Section 2.3.2.3 of the Final EIS/OEIS, the alternative of training during winter in the GOA TMAA was considered. Unstable winter weather conditions in the Gulf of Alaska create unsafe conditions for Navy training and such alternatives were considered infeasible and were not evaluated further. Regarding the level of training and the alternative that will be selected, please see response to McGuire – 2.
Ellen Americus 1		Hi, my name is Ellen Americus and I'm just a resident of Cordova. I used to live a Hatcher Pass and there was a lot of air activity over Hatcher Pass, in a pristine environment. And socially I think it really upset a lot of people who recreated there. And I see that the Gulf of Alaska is a wild place, and that area in particular. And I think that bombs and missiles in that area and a lot of aircraft would be upsetting to citizens and wildlife.	The GOA Final EIS/OEIS deals with Navy training in the Temporary Maritime Activities Area and therefore did not analyze impacts to inland areas. Analysis of overflight noise can be found within the Air Force and Army documents listed in the Final EIS/OEIS and available on the GOA EIS website. Additionally, because sound-generating events in the TMAA are intermittent, occur in remote areas or off-limits areas, and do not expose the public to high noise levels, no sensitive receptors are likely to be exposed to sound from military activities.
Ellen Americus 2		And I'm especially concerned about when the missiles and the bombs breakdown in the water, and so there's like lead, and heavy metals, and when that stuff goes through the food chain and bio-cumulates. And you know, it's going to effect these people. And you know, I don't have -- we've learned a lot about plastics and how harmful plastics are in the food chain. And heavy metals, that's even scarier to me. So, anyway thank you.	The bioaccumulation process is discussed in this EIS/OEIS in Section 3.8 and Section 4.2.8.2. A detailed species by species analysis of bioaccumulation potential for all possible contaminants is not possible with the best available scientific data at this time. Impacts from bioaccumulation present a large and complex set of variables, including marine mammal and fish occurrence in the TMAA, population size, toxicity to each individual species, and habitat types and characteristics of the TMAA. An analysis of this magnitude would overwhelm the

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
Cordova			
			reader with details and scientific data, without adding substantial value to the overall analysis conclusions. Due to the short-term duration and impacts of Navy training activities in the GOA, bioaccumulation impacts are not significant
Kristin Smith 1		Hi, I'm Kristin Smith. And I'm here speaking on my own behalf. My day job is working as a nonprofit director for the Copper River Water Shed Project, which is committed to sustainable economic development. And so I have a lot of interaction with fisherman and folks in this area, and what I often tell people is that what we have in this region, both down here in Cordova and up river, is a wild salmon economy. We have a commercial salmon economy, we have a subsistence salmon economy, both here and up river. And we have a sport fish salmon economy. And all that's happening because those fish are rearing and growing to adulthood out in the Gulf of Alaska and in the Pacific Ocean. That is where they live. And that is where this town's livelihood comes from. And I'm only repeating what everybody else has already said, but we do not want to see SONAR in this region because of the effect that it could have on fish and wildlife. And I admittedly took a very quick, cursory look through there on the posters, but I saw words like anticipated. We anticipate this won't have very much effect. That's not good enough for a whole town full of people, both here and up river that depend on fish for their livelihood. And I think it doesn't just Cordova, it effects other towns in the sound and Yakutat, and other areas along the coast. So, I think it's critical that the Navy think very, very hard about the effects that this has on wildlife.	As detailed in Section 3.6, the best available science indicates that salmon cannot hear within the frequency range of the sonar proposed for use in the Gulf of Alaska. Please also be aware that sonar use outside the Navy is common in the Gulf of Alaska including, for example, fathometers, fish-finders, and NOAA research involving acoustic trawl surveys for fishery resources. In Navy training ranges in Southern California, Hawaii, and the East Coast where training involving sonar use has been occurring for decades, there are no indications of impacts to the marine environment and these areas continue to support healthy fisheries and abundant marine mammal populations.
Kristin Smith 2		And I think that when the Navy started, and maybe other entities started using SONAR, the effects weren't so well know. But we know a lot more now then we did 20 years ago. We know that it has harmful effects on marine mammals. And knowing that -- you know, I understand that you're probably thinking, hey we have a lot to do with -- we have to protect national security. Well, in my mind the national security issues are over in the Middle East today. And this money could be better spent doing other things and not adversely effecting our fish and wildlife. Thank you. And I just want to say thank you for doing this EIS. I understand that you haven't necessarily been doing them regularly over	Please see your previous comment regarding indications of impacts to the marine environment. Please see Section 3.6 with regard to an analysis of impacts to fish and fish habitat and Section 3.12.1.1 for an analysis of impacts to fishing. Additionally, please see Section 5.2.1.4 regarding research planned as part of the monitoring associated with Navy training events in the Gulf of Alaska. The U.S. Navy has developed a GOA TMAA Monitoring Plan to provide marine mammal and sea turtle monitoring as required under the MMPA of 1972 and the ESA of 1973. The GOA TMAA Monitoring Plan proposes monitoring goals for marine mammals that are unique with regard to their breadth as well as their focus on potential

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
		Cordova	
		the past few years. So, I appreciate that you are coming here and asking us for our comments. Thanks.	impacts of mid-frequency active sonar (MFAS) and underwater explosions on marine mammals and sea turtles.
Carolyn Roesbery		My name is Carolyn Roesbery. Any other information? Okay. I'm not convinced that activities -- Naval activities in the Gulf of Alaska won't contribute to the decimation of our fishery. We have one of the last wild salmon fisheries in the world. We have very rich, diverse environment. It is one of the biggest fresh water influxes in the world, here in Prince William Sound. We're just now finding out what our fish are doing when they're not in the spawning and where they're going. We just now have the technology and are researching that. And it is out there where you intend to be. And I'm not convinced that -- that you have all the science that you need. You may have acquired all the available science that is assessable to you, but I think you need to go further. I think it's very, very important. Thank you.	The Navy conducted a thorough analysis of sonar and at sea explosions in the EIS/OEIS, using the most current and best available science, and with cooperation from the National Marine Fisheries Service, which is responsible for the protection of marine species. Because there is no indication from areas where the Navy routinely trains that training activities have a negative impact on the health of the marine environment, the Navy is confident that there is little relative risk to marine mammal populations from active sonar training or any other training events.
Kris Ranney		I'm Kris Ranney, I'm in the Boy Scout Troop 624. And just to add on to what she just said. There's another species of fish that lives out there, the halibut. Most of them move in the summer to shallow waters, but some of the bigger fish stay out in the deep water. So, when you are bombing those boats and sinking them, and some of the bombs and guns might disrupt their habitat. And a lot of peoples livelihoods depend on the halibut too. So, that's just what I think. And it takes 25 years to -- for a halibut to get to 100 pounds, so -- and after that they're growth slows even more. So, if one of the ships hits a 600 pound halibut that would take 100's of years to replace. So, thanks for your time.	Thank you for participating in this public process. The activity where a ship or hull is sunk is called a SINKEX. This event, by regulation, must take place where the depth is over 1,000 fathoms (Section 2.6.1.1 of the Final EIS/OEIS, Figure 2-7). While it is possible a halibut could be off the bottom and in the water column where a SINKEX occurred, this would be a very unlikely co-occurrence and it is even less likely that the ship or hull would hit a halibut.

ID	Organization	Public Comment (Individual Oral Comment)	Navy Response
Cordova			
Danielle Bennett 1		Okay. My name is Danielle Bennett and I'm a resident of Cordova. From my perspective Alaska has one of the few functioning fisheries left in the world. From what I've seen of the EIS, the impact has been minimized to individuals, but many individual impacts amount to a cumulative negative effect. We know for a fact that SONAR does have a negative impact. And that is reason enough to not expand the activities, as far as I'm concerned.	As detailed in Section 3.6, most fish cannot hear in the frequency range of mid and high frequency sonar. While there may be a few species that can hear within this range, it is anticipated that the effects could range from no effect to physical damage and that it would be dependent on intensity and proximity (basically the list of potential effects that was provided in Section 3.6.2.2.3). Given the temporal and spatial nature of the activities, it is anticipated that any effect would be localized and not affect fish populations as a whole. Also note that sonar in the frequency range of that used by the Navy for Anti-submarine warfare is often used in acoustic trawl surveys by NOAA in fisheries research. It is not likely that sonar use by the Navy will have any impact, individual or cumulative, on fisheries in the Gulf of Alaska.
Danielle Bennett 2		What concerns me even more, however is -- are the things that we don't know. There are a number of uncertain statements. Anticipated effects, possible outcomes that are indicated. This ecosystem is important enough that those things should be addressed first before we have negative impacts that we don't even anticipate.	While additional research or further scientific advances may provide a more definitive analysis, a NEPA document is necessarily based on information available at the time the document is prepared, and the current state of the science. The Navy also acknowledges that it is impossible to know the exact impacts that Navy training activities will have on the ecosystem in the GOA in advance of these activities. Taking into consideration that there is no indication, in any area where the Navy trains, that training activities have a negative impact on the health of the marine environment, the Navy is confident, and the analysis indicates, that its training activities will not impact the marine environment off the Gulf of Alaska.
Danielle Bennett 3		Please find another habitat or an already dead zone in which to operate. Historically speaking, this region has little reason to trust in regulation. When I think of national security, I see protecting whatever is left of functioning ecosystems as of the most vital importance. I recommend proceeding with the no action alternative or reduce activity all together. Thank you.	As described in Section 2.3.2.1, the Navy considered, but rejected, alternatives that included moving this exercise to other locations. Such alternatives fail to meet the purpose of and need for the proposed action. Also, as explained in Section 2.3.2 of the EIS/OEIS, a reduction in levels of training within the GOA ATAs would not support the Navy's Purpose and Need and was therefore eliminated from further consideration. Finally, as explained in Section 1.4 of the EIS/OEIS, the decision on which alternative the Navy will pursue will be made in light of the Purpose and Need by Navy representatives following the review of all relevant facts, impact analyses, and comments received via the EIS/OEIS public participation process.

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RECORD OF DECISION

ISSUANCE OF MARINE MAMMAL PROTECTION ACT (MMPA) REGULATIONS TO TAKE MARINE MAMMALS INCIDENTAL TO U.S. NAVY TRAINING ACTIVITIES IN THE GULF OF ALASKA TEMPORARY MARITIME ACTIVITES AREA

Supported by: U.S. Navy Final Environmental Impact Statement/ Overseas Environmental Impact Statement for the Gulf of Alaska Temporary Maritime Activities Area

National Oceanic and Atmospheric Administration

National Marine Fisheries Service

Office of Protected Resources

Silver Spring, Maryland

In accordance with the National Environmental Policy Act (NEPA) and its implementing regulations and the National Oceanic and Atmospheric Administration's (NOAA's) Administrative Order 216-6 Environmental Review Procedures for Implementing the National Environmental Policy Act, this document comprises NOAA's National Marine Fisheries Service's (NMFS) Record of Decision (ROD) for issuance of regulations pursuant to section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA; 16 U.S.C. 1361 *et seq.*) to the U.S. Navy (Navy) for the taking of marine mammals incidental to the conduct of specified activities in the Gulf of Alaska Temporary Maritime Activities Area (GoA TMAA).

I. INTRODUCTION

In March 2009, NMFS received an application from the Navy requesting five-year regulations and authorizations for the take of 20 species of marine mammals incidental to Navy training activities to be conducted within the Navy's Gulf of Alaska Temporary Maritime Activities Area, which is a 42,146 nm^2 polygon situated south of Prince William Sound and east of Kodiak Island, for the period of April 2011 through April 2016. These training activities may incidentally take marine mammals present within the GoA TMAA by exposing them to sound from mid-frequency or high-frequency active sonar (MFAS/HFAS) or to underwater detonations at levels that NMFS associates with the take of marine mammals as defined by the MMPA. NMFS' issuance of MMPA regulations to the Navy governing the incidental take of marine mammals is a Federal action for which NMFS is responsible for analyzing the effects on the human environment pursuant to NMFS' NEPA procedures.

NMFS participated as a cooperating agency in the development of the Navy's Final Environmental Impact Statement/Overseas Environmental Impact Statement (hereinafter, FEIS),

which contained an analysis of the effects of the Navy's activities on the human environment. NMFS worked closely with the Navy to provide information in NMFS' area of expertise to support the FEIS' effects analyses for endangered species, marine mammals, and other marine resources. In accordance with the NEPA regulations at 40 CFR 1506.3, NMFS analyzed the Draft EIS and concluded that NMFS' comments and suggestions have been addressed. NMFS adopted the Navy's FEIS in March 2011.

A. Navy Proposed Action

As described in the FEIS, the Navy proposes to implement actions within the GoA TMAA to:

- Support PACOM training requirements;
- Support Joint Task Force Commander training requirements;
- Achieve and maintain Fleet readiness using the GoA TMAA to support and conduct current, emerging, and future training activities; and
- Expand warfare missions supported by the GoA TMAA, consistent with requirements.

Conducting current and future training activities and implementation of GoA TMAA enhancements includes a collection of actions, both land-based and ocean-based, that are evaluated in the Navy's FEIS. Alternative Navy implementation scenarios are described in detail in the FEIS and action alternatives involve combinations of the following elements:

- Maintain current levels of military readiness by training in the GoA TMAA;
- Accommodate further increases in training activity tempo in the GoA TMAA;
- Support the acquisition and implementation into the Fleet of advanced military technology using the GoA TMAA to conduct training activities for new platforms and associated weapons systems;
- Identify shortfalls in training, particularly training instrumentation, and address through enhancements;
- Maintain the long-term viability of the GoA TMAA as a premiere Navy training area while protecting human health and the environment, and enhancing the quality, capabilities, and safety of the training area; and
- Be able to bring Army, Navy, Air Force, and Coast Guard assets together into one geographic area for joint training.

B. NMFS' MMPA Decision Authorities

Sections 101(a)(5)(A) and (D) of the MMPA direct the Secretary of Commerce (Secretary) to allow, upon request, the incidental, but not intentional taking of marine mammals by U.S. citizens who engage in a specified activity (other than commercial fishing) during periods of not more than five consecutive years if certain findings are made and regulations are issued or, if the taking is limited to harassment and of no more than 1 year, the Secretary shall issue a notice of proposed authorization for public review.

As described in the Navy's November 2009 application, the specified Navy activities to be conducted in the GoA TMAA are expected to take marine mammals as defined by the MMPA,

and the Navy requested incidental take authorization in accordance with Section 101(a)(5)(A) of the MMPA. In order to issue the regulations and subsequent Letters of Authorization (LOAs) under this section, NMFS must make the determination that the specified activities will result in a negligible impact on the affected species or stocks and not result in an unmitigable adverse impact on the availability of marine mammal species or stocks for taking for subsistence uses. In addition, NMFS, as part of its regulatory process, is required to prescribe the permissible methods of taking, the means of effecting the least practicable adverse impact on the species or stock and its habitat (i.e., mitigation) and to set forth requirements pertaining to monitoring and reporting of such taking.

NMFS has defined "negligible impact" as "an impact resulting from the specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stock through effects on annual rates of recruitment or survival." (50 CFR § 216.103)

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The National Defense Authorization Act (NDAA) (Public Law 108-136) amended the MMPA, by removing the "small numbers" and "specified geographical region" limitations and amending the definition of "harassment" as it applies to a "military readiness activity" to read as follows (Section 3(18)(B) of the MMPA):

(i) an y act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [Level A Harassment]; or

(ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [Level B Harassment].

The MMPA also contains a provision related to "military readiness activities" that requires NMFS, when making a determination of "least practicable adverse impact on such species or stock" to consider personnel safety, practicality of implementation and impact on the effectiveness of the military readiness activity. Before making the required determination, NMFS must consult with the Department of Defense regarding the mitigation measures and their effect on the aforementioned factors.

II. NMFS' DECISION AND FACTORS CONSIDERED IN THE DECISION

A. THE DECISION

NMFS' decision is to issue regulations and the 2011 LOA (and subsequent LOAs, as appropriate) for the unintentional take of marine mammals incidental to specified activities included within the FEIS Alternative 2, which was the preferred alternative identified in the Draft EIS and the action presented to NMFS in the Navy's March 2009 application (as updated). The regulations will govern the unintentional taking of marine mammals incidental to training activities conducted in the GoA TMAA for the period of April 2011 through April 2016. Alternative 2 of the FEIS includes an analysis of all of the activities for which the Navy has requested incidental take authorization pursuant to the MMPA. The regulations will prescribe the permissible methods of taking, the means of effecting the least practicable adverse impact on

the species or stock and its habitat (i.e., mitigation) and will set forth requirements pertaining to monitoring and reporting of such taking for the specified activities, as described in Alternative 2.

The Navy will be authorized to take individuals of 20 species of marine mammals by Level B Harassment. Although NMFS does not anticipate that it will occur, the Navy will be authorized to take, by injury or mortality, up to 15 individuals of 3 beaked whale species incidental to naval exercises in the GoA TMAA over the course of the 5-year regulations. NMFS will issue a final rule that establishes a framework in which incidental take can be authorized through issuance of annual (or, other period, as warranted) LOAs.

B. FACTORS CONSIDERED IN REACHING THE DECISION

In the FEIS, the affected environment and environmental consequences are both discussed in Chapter 3, within subsections arranged by Resource type, including: Air Quality; Expended Materials; Water Resources; Acoustic Environment (Airborne); Marine Plants and Invertebrates; Fish; Sea Turtles; Marine Mammals; Birds; Cultural Resources; Transportation and Circulation; Socioeconomics; Environmental Justice and Protection of Children; and Public Safety. A section addressing Marine Protected Areas and Marine Managed Areas is included within the Marine Plants and Invertebrates chapter. Appendix D contains additional information on marine mammals and the modeling used by the Navy to quantitatively evaluate impacts to marine mammals. The Marine Mammals subchapter (3.8) and Appendix D contain the majority of the analysis that relates to NMFS' action of issuing incidental take regulations. Other sections of the FEIS contain analyses related to potential impacts on marine mammal habitat and further support NMFS' proposed issuance of regulations and the 2011 LOA. In addition, Chapter 4 provides an assessment of potential cumulative impacts, including analyzing the potential for cumulatively significant impacts to the marine environment and marine mammals.

Within the Marine Mammals section (and Appendix D), the Navy's FEIS addresses potential acoustic impacts resulting from MFAS/HFAS or explosive detonations, as well as non-acoustic impacts (such as ship strikes). These sections describe in detail the acoustic thresholds that NMFS uses (including the development of a new risk function for assessing potential behavioral disturbance of marine mammals) to indicate at what received sound levels marine mammals will be considered taken pursuant to the MMPA. The FEIS also describes in detail the analytical framework and model that the Navy uses to estimate take, based on NMFS' acoustic thresholds. Last, the Navy presents estimates (for each alternative) of the number of each species of marine mammal that will be exposed to levels of sound that NMFS has determined will result in Level A or Level B Harassment. The Navy uses these take estimates, combined with the other information included in this Chapter to conclude that none of the alternatives will result in any adverse population level effects on any of the affected species or stocks. The take estimates for the Navy's preferred alternative are the subject of the Navy's request to NMFS for MMPA Section 101(a)(5)(A) authorization.

As described above, the environmental consequences to the marine environment are of particular importance for NMFS' evaluation in reaching the decision to issue MMPA incidental take regulations. In particular, because NMFS' action is specific to authorizing unintentional take of marine mammals, the key factors considered in the decision are related to NMFS' statutory

missions under the MMPA and the Endangered Species Act (ESA). The primary documents supporting this decision are the Navy's GoA TMAA FEIS and the GoA TMAA Programmatic Biological Opinion.

As a cooperating agency, NMFS assisted the Navy by providing technical information and analyses to evaluate the effects of naval training exercises on marine mammals and their habitat. Via the MMPA process, NMFS reviewed the Navy's request to determine whether the total taking resulting from the activities would have a negligible impact on the affected species or stocks of marine mammals, would not have an unmitigable adverse impact on the availability of those species or stocks of marine mammals intended for subsistence uses, and that the permissible methods of taking and requirements pertaining to the mitigation, monitoring and reporting of such takings are set forth. As supported by the FEIS, NMFS has made the requisite findings under the MMPA and will include these findings in a final rule.

Key relevant factors considered by NMFS in this decision include:

- Requiring mitigation. As noted above, for military readiness activities, NMFS is required to consider personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity when it makes its determination of "least practicable adverse impact." NMFS consulted with the Navy via the MMPA process and as a NEPA cooperating agency before making the required determination. NMFS assisted in the preparation of a section of the GoA TMAA FEIS (mitigation measures considered but eliminated) that augments the analysis of mitigation measures. This section included additional analysis of mitigation measures NMFS considered during the MMPA rulemaking, with particular emphasis on whether these measures would be beneficial, effective and practicable.

- Addressing uncertainty. The FEIS acknowledges a degree of uncertainty regarding the effects of underwater sound on marine mammals. NMFS provided extensive input in the FEIS process to address these uncertainties, and has included requirements for mitigation, monitoring and reporting by Navy in the final rule to manage uncertainty. The key issues and the manner in which they are addressed in the final rule include:

    1. Uncertainty regarding behavioral effects of MFAS/HFAS on marine mammals was addressed in the FEIS via development of a new risk function for quantifying behavioral harassment takes by MFAS/HFAS; the final rule will authorize Level B harassment based both on this risk function and "temporary threshold shift" criteria.
    2. Continuing management to reduce uncertainty will be implemented via the MMPA final rule by requiring extensive monitoring and reporting by the Navy, including the establishment and implementation of a monitoring plan specific to the GoA TMAA and an Integrated Comprehensive Monitoring Plan. These plans are available on NMFS' website, and are specifically designed to be iterative and provide feedback to support NMFS' use of adaptive management throughout rule implementation, as presented in the FEIS and further explained in the final rule.

Drafts of these plans were made available for comment on the NMFS website concurrent with availability of the MMPA proposed rule.

3. Finally, while not a required component of the final rule, the Navy's FEIS describes the Navy's continuing commitment to marine mammal research, in particular research related to the effects of underwater sound on marine mammals. NMFS will continue to encourage and support the Navy's research efforts. The timeframe for completing the research and conducting an assessment of how that research factors into MMPA authorizations however, does not allow NMFS to wait for the results of the research prior to authorizing the Navy's request for incidental take.

NMFS finds that the FEIS appropriately acknowledges uncertainty and provides detailed analyses as to how existing information is incorporated to assess effects where uncertainties exist, and to address and manage uncertainty via mitigation, monitoring, reporting and research.

- Considering effects to ESA-listed marine mammals. On April 6, 2011, NMFS issued a programmatic biological opinion on the U.S. Navy's proposal to conduct training exercises in the GoA TMAA from April 2011 through April 2016 and the Permits Division's proposal to issue regulations to authorize the U.S. Navy to "take" marine mammals incidental to the conduct of training exercises in the GoA TMAA during the same period of time. The Biological Opinion concludes that the proposed regulations and any take associated with activities authorized by those regulations are not likely to jeopardize the continued existence of threatened or endangered species in the action area during any single year or as a result of the cumulative impacts of annual authorizations. The Biological Opinion includes an explanation of how the results of NMFS' baseline and effects analyses in Biological Opinions relate to those contained in the cumulative impact section of NEPA documents. In particular, these analyses consider the effects resulting from interactions of potential stressors, thereby augmenting the FEIS' cumulative impacts analysis.

  The Biological Opinion includes a discussion of the FEIS' marine mammal take estimates, but relies on exposure and response analyses. The exposure analysis identifies the listed resources that are likely to co-occur with effects in space and time and the nature of that co-occurrence, to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent. The take estimate approach and the exposure/response approach are appropriate under the MMPA and ESA, respectively, and both were considered in reaching this decision regarding the issuance of a rule, 2011 LOA and subsequent LOAs for the Navy activities in the GoA TMAA. The final rule addresses the manner in which the number of takes of listed marine mammals proposed to be authorized in LOAs issued under this regulation will be aligned with the exposure analysis methodologies and subsequent Incidental Take Statements issued in association with subsequent Biological Opinions.

- Approach to assessments. NEPA, ESA and MMPA involve differing approaches to assessing effects on those resources considered under each statute, and this combination of analyses provides a robust basis for the decision on this action. The FEIS, Programmatic Biological Opinion, and final rule for the GoA TMAA present the assessments in detail, but a few salient issues and difference are highlighted here. First, both the FEIS and the Biological Opinion include analysis of the significance of the Navy activities on marine mammals (listed marine mammals in the Biological Opinion). In the FEIS, the term "significance" is as commonly used in NEPA, without additional definition of significance related to marine mammals. The Biological Opinion describes how the use of the term is distinguished in the opinion among three different kinds of "significance," which includes an assessment of how any "significant" physical, chemical, or biotic responses are likely to have "significant" consequence for the fitness of the individual animal. As described earlier, the MMPA uses the term "negligible impact" (defined above). For this ROD, the FEIS evaluation of the significance of impacts to species was considered as input to NMFS' ESA and MMPA assessments; this decision is supported by the FEIS and also reached based on NMFS statutory responsibilities under the MMPA and ESA.

Coastal Zone Management Act Concerns. On July 10, 2010, the Navy submitted a De Minimis Determination under 15 CFR Section 930.33(a)(3)(i) for the proposed action to the Alaska Department of Natural Resources. This was based on the Navy's determination that the activities analyzed under the FEIS were expected to have only insignificant direct or indirect (secondary and cumulative) coastal effects. The Alaska Department of Natural Resources concurred with the De Minimis Determination by letter on October 14, 2010.

Essential Fish Habitat. The Navy determined that their activity will not have adverse impacts to Essential Fish Habitat. However, NMFS' Alaska Region Office of Habitat Conservation reviewed the Navy's Essential Fish Habitat Assessment pursuant to the Magnuson-Stevens Act and did not concur with the "no adverse impact" determination and subsequently provided conservation recommendations to the Navy on January 4, 2011. The Navy responded in writing to each of NMFS' recommendations on January 24, 2011, electing to implement two of NMFS' four conservation recommendations.

III. OTHER ALTERNATIVES CONSIDERED

The alternatives analyzed in the Navy's FEIS and their relationship to NMFS' alternatives are described here. NMFS' proposed action (issuance of regulations and LOAs) would authorize take of marine mammals incidental to a subset of the activities analyzed in the Navy's GoA TMAA FEIS that are anticipated to result in the take of marine mammals, i.e., those activities that involve the use of MFAS, HFAS, or underwater detonations. Thus, these components of the Navy's proposed action are the subject of NMFS' proposed MMPA regulatory action. (Note that, although NMFS fully (rather than partially) adopted the GoA TMAA FEIS, the purely terrestrial activities described in the FEIS are not a component of NMFS' proposed action.) The Navy's FEIS contains a thorough analysis of the environmental consequences of their proposed action (with specific sections for MFAS/HFAS and underwater detonations) on the human environment, including a specific section on marine mammals.

A. Summary of the Alternatives Considered by the Navy

The Navy's FEIS indicates that, in order to support the purpose and need, any alternative considered for analysis should support or employ:

1. Appropriate physical environment, including unique and complex bathymetric and oceanographic conditions because these attributes combine to provide a challenging environment for Navy forces to conduct Anti-Submarine Warfare (ASW);
2. Proximity of Alaska land and sea training areas to each other to accommodate the joint training mission. The location of the TMAA is directly related to the location of permanent land and air training ranges in Alaska and supports the mission requirements of Alaskan Command to conduct joint training for Alaska-based forces;
3. Availability of sufficiently sized airspace and ranges that support tactically realistic joint training activities;
4. Appropriate weather conditions for a cold-water environment (water temperature between 50 and 60 degrees Fahrenheit) suitable for maritime activities at sea, including sea state of three or less on the Beaufort scale (defined as moderate sea; average wave height is 2-4 ft;
5. Minimal encroachments on joint training requirements;
6. Training sustainment in support of Department of Defense Title 10 mandate; and
7. Proximity to shipping lanes for realistic training on avoiding conflicts with air and marine traffic.

Three alternatives were analyzed in the FEIS, including two action alternatives (Alternatives 1 and 2) and the No Action Alternative.

No Action Alternative: The No Action Alternative is required by CEQ regulations as a baseline against which the impacts of the Proposed Action are compared. In the FEIS, the No Action Alternative is represented by baseline training and large-scale joint exercises continuing at current levels without operating active sonar. The No Action Alternative organizes training activities into the following five Primary Mission Areas: Anti-Air Warfare, Anti-Surface Warfare, Electronic Combat, Navy Special Warfare, and Strike Warfare.

Alternative 1 (Increase Training Activities and Accommodate Force Structure Changes): Alternative 1 includes all ongoing Navy training associated with the No Action Alternative, and proposes an increased number of such training activities designed to meet Navy and DoD current and near-term operational requirements. This increase would involve conducting one large-scale joint force exercise, including ASW activities and the use of active sonar, occurring over a maximum time period of up to 21 consecutive days during summer months (April through October). Alternative 1 would include basic individual or unit level training events of relatively short duration occurring simultaneously with the large-scale joint force exercise. Alternative 1 would also accommodate increases in training activities due to force structure changes associated with the introduction of new weapon systems, vessels, aircraft, and training instrumentation into the Fleet. Training activities associated with force structure changes would be implemented for the EA-18G Growler, Guided Missile Submarine (SSGN), P-8 Multimission Maritime Aircraft

(MMA), DDG 1000 (Zumwalt Class), and unmanned aerial systems (UASs). Force structure changes associated with new weapons systems would include new types of sonobuoys. Force structure changes associated with new training instrumentation include the use of a Portable Undersea Tracking Range.

Alternative 2 (Preferred Alternative) Increase Training Activities, Accommodate Force Structure Changes, and Implement Range Enhancements: Alternative 2 would include all of the activities described in Alternative 1 plus a further increase in training over the levels identified in Alternative 1. This increase would involve the following activities: one additional separate large-scale joint force exercise occurring over a period of up to 21 days; and a SINKEX during each summertime exercise (a maximum of two) within the TMAA. Table 2-5 in the FEIS describes the baseline and proposed increases in operations, i.e., a comparison of the number of different exercises analyzed under each alternative.

The following four alternatives were considered by the Navy, but not carried forward for analysis because, after careful consideration, the Navy determined that they did not meet the Navy's purpose and need for the Proposed Action:

- Alternative range complex locations
- Simulated training
- Reduction in the level of current training in the GoA TMAA
- Alternative time period

B. SUMMARY OF ALTERNATIVES CONSIDERED BY NMFS

For all of the Navy alternatives identified above, the Navy includes an associated list of standard protective measures specifically developed to minimize adverse impacts on marine mammals. NMFS worked closely with the Navy throughout the development of the FEIS to identify additional mitigation measures (for marine mammals) that the Navy should consider in their analysis. As a result of this cooperating agency role, the Navy discussed and considered 16 additional mitigation measures in its FEIS, but determined these were not able to be implemented either because the measures were not consistent with mission requirements or were prohibitively difficult to implement, or because the Navy's analysis concluded that the measures did not provide sufficient protective benefits to marine mammals. The inclusion of the analysis of these additional mitigation measures strengthens the FEIS' support and coverage of NMFS' FEIS alternatives, which are listed below. These alternatives are not enumerated in the Navy FEIS, but are supported by the analyses in that FEIS:

- The Navy's training activities (no active sonar) would continue at baseline levels. The Navy would not request, and NMFS would not issue, an incidental take authorization for an increased level of activity (for NMFS, this constitutes the NEPA-required No Action alternative);
- NMFS promulgates regulations and issues LOAs authorizing take of marine mammals incidental to a subset of the Navy training activities (i.e., those including the use of MFAS/HFAS or underwater explosives) described in the FEIS preferred alternative (Alternative 2), with the mitigation, monitoring and reporting measures presented in Chapter 5 of the FEIS (except those considered but eliminated); or

- NMFS promulgates regulations and issues LOAs authorizing take of marine mammals incidental to a subset of the Navy training activities (i.e., those including the use of MFAS/HFAS or underwater explosives) described in the Navy's preferred alternative, but with additional mitigation requirements for marine mammals, potentially including measures considered but eliminated in Chapter 5 of the FEIS or other additional measures developed by NMFS or suggested to NMFS via public comment on the proposed rule.

Based on the FEIS and additionally supported by NMFS response to public comments in the preamble to the final rule, NMFS determined that the mitigation measures identified in the FEIS (Chapter 5, except those measures considered but eliminated) will effect the least practicable adverse impact on marine mammal species or stocks and their habitat. All of the measures chosen to be included in the MMPA final rule are components of the FEIS Alternative 2 (second bullet, above).

C. The Environmentally Preferable Alternative

The No Action Alternative described in the Navy's FEIS is the baseline level of training being conducted in the GoA TMAA annually prior to the Navy's [insert date] ROD. The No Action Alternative includes training activities in five Primary Mission Areas, including major Anti-Air Warfare and Anti-Surface Warfare exercises that would continue at baseline levels. Both Alternatives 1 and 2 (preferred alternative) include increased numbers of exercises above those numbers analyzed in the No Action Alternative (including the addition of Anti-Submarine Warfare training utilizing MFAS/HFAS and underwater detonations, which are predicted to result in the take of marine mammals). The No Action is considered the environmentally preferred alternative.

IV. PUBLIC INVOLVEMENT

Public opportunities for review and comment have occurred in support of the FEIS preparation and the consideration of MMPA rulemaking. Detailed information on the publications in which the Notice of Intent to prepare an EIS and the Draft EIS were noticed are provided in Appendix A of the FEIS, and the FEIS was similarly made available on March 11, 2011. The distribution list for the FEIS is presented in Appendix G.

NMFS personnel attended the information meetings and hearings on the Draft EIS, when available, which were held at various locations in Alaska. The Navy received comments on the Draft EIS from individuals, agencies, and organizations. The comments expressed interest or concern for numerous issues including: marine mammals and effects from sonar and underwater detonations, fishing and tourism, airborne noise, NEPA process, alternatives selection, military expended materials, and mitigation measures. The FEIS addressed all oral and written comments received during the Draft EIS comment period. As a cooperating agency, NMFS assisted in the analysis and consideration of public comments in NMFS' areas of jurisdiction and expertise to support the development of the FEIS. The Navy ensured the FEIS was mailed to all individuals, agencies, and organizations that requested a copy of the final document, and that the FEIS remains available on the website at http://www.gulfofalaskanavyeis.com.

The Navy received four comment letters during the FEIS wait period and will include a summary of the comments in their ROD, when issued. NMFS was provided with and reviewed the FEIS comment letters. All of the comments on the GoA TMAA FEIS that are related to NMFS' action (the issuance of an MMPA authorization) have been considered by NMFS in reaching this decision. The comments either (1) reiterated comments received on the Draft EIS and were already covered by Navy in the FEIS, (2) were related to mitigation and were similar to issues considered by NMFS and the Navy in the "Mitigation Measures Considered but Eliminated" section, or (3) were received as similar comments on the MMPA proposed rule and were considered in developing the final rule (these will be specifically addressed in the response to comments to be published in the preamble of the final rule).

Substantial public involvement also occurred in association with NMFS' rulemaking. On February 2, 2010 (75 FR 5575) NMFS published a notice of receipt of the application for letter of authorization for the U.S. Navy's GoA TMAA, with a request for comments and information open through March 5, 2010. On October 19, 2010 (75 FR 64508), NMFS published a proposed rule in response to the Navy's request to take marine mammals incidental to military readiness training exercises in the GoA TMAA and requested comments, information and suggestions concerning the request. During the 30-day public comment period, NMFS received comments from the Marine Mammal Commission, the Natural Resources Defense Council (on behalf of the Alaska Center for the Environment, Alaska Community Action on Toxics, Alaska Wildlife Alliance, Animal Welfare Institute, California Gray Whale Coalition, the Center for Biological Diversity, Cetacean Society International, Cook Inletkeepers, Defenders of Wildlife, the Humane Society of the United States, Juneau Group Sierra Club, Kachemak Bay Conservation Council, Kodiak Audubon Society, Kodiak Gray Whale Project, Kodiak Whale Fest, North Gulf Oceanic Society, Oceana, Sierra Club Alaska Chapter, and Whale and Dolphin Conservation Society), Ocean Conservation Research, as well as interested members of the public. The comments were considered in developing the final rule, and detailed responses to those comments are included in the preamble to the final rule. The categories of public comments addressed include additional mitigation recommendations, mitigation effectiveness, impact analyses, monitoring and reporting, general opposition to the rulemaking, and other comments not specific to a category.

Public input was carefully considered by NMFS in developing a final rule and in reaching this decision to issue the regulations for the activities specified in FEIS Alternative 2.

V. MITIGATION, MONITORING AND REPORTING MEASURES

The final rule includes detailed mitigation measures that must be implemented by the Navy when conducting specified activities in the GoA TMAA. Inclusion of these requirements ensures that NMFS' action of issuing incidental take regulations specifies and requires all practicable means to avoid or minimize environmental harm from the selection of FEIS Alternative 2. In addition, NMFS' final rule will specify the requirements for Navy to implement a monitoring and reporting program. In addition to the requirements that will be established in the rule and required of Navy, NMFS will conduct the following activities as part of the continuing MMPA implementation process:

1. NMFS will provide the Navy with guidance and support for their convening of a monitoring workshop, which will include marine mammal and acoustic experts as well as other interested parties, in 2011.

2. NMFS will meet annually with the Navy to discuss the required Navy monitoring reports, Navy R&D developments, and current science and whether mitigation or monitoring modifications are appropriate. This use of adaptive management via the MMPA process will allow NMFS to consider new data from different sources to determine (in coordination with the Navy) on an annual basis if mitigation or monitoring measures should be modified or added (or deleted) if new data suggests that such modifications are appropriate (or are not appropriate) for subsequent LOAs.

3. As outlined in the NOAA Administrator's January 2010 letter to CEQ, NMFS will convene two parallel, focused, relatively small, and product-driven working groups. One will identify and map cetacean "hot spots", defined as areas of known, or reasonably predictable, biological importance (i.e., for reproduction, feeding, migration) and/or high densities. The second working group will be directed toward developing a comprehensive data collection and analysis plan for describing and predicting underwater sound fields in different areas. The outcomes of these working groups will be integrated and analyzed in a broader follow-on symposium to include a larger audience of scientists, industries, federal agencies, conservation managers, and environmental NGOs. The final products and analyses will provide a more robust, comprehensive, and context-specific biological and acoustic basis by which to inform subsequent management decisions regarding human noise in our oceans. The steering committee for this effort is currently being convened, the working group efforts should take about a year to complete, and we expect the final symposium to be held in late 2011.

VI. CONCLUSIONS

Through the FEIS and as documented in this ROD, NMFS has considered the goals and objectives of the NMFS' proposed action and has analyzed a reasonable range of alternatives that adequately address the objective of the proposed action. Furthermore, NMFS has analyzed the associated environmental consequences of the identified alternatives and the mitigation measures and monitoring requirements needing to be analyzed and required under the final rule and LOAs. NMFS has also considered the public comments addressed to the Navy in the FEIS and the comments addressed to NMFS during the proposed rule comment period. Consequently, NMFS has selected the alternative of issuing regulations authorizing the unintentional harassment of marine mammals incidental to Navy activities in the GoA TMAA in accordance with Alternative 2 of the FEIS for the period April 2011 through April 2016, including in that regulation specified requirements for mitigation, monitoring and reporting.

Signed: _____ Date: 4/20/11

Eric C. Schwaab
Assistant Administrator for Fisheries