UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

# Endangered Species Act (ESA) Section 7(a)(2) Programmatic Biological Opinion
# Arctic National Wildlife Refuge Coastal Plain Lease Sale

**NMFS Consultation Number: AKRO-2019-00141**

**Action Agency: U.S. Department of Interior, Bureau of Land Management**

**Affected Species and Determinations:**

| ESA-Listed Species | Status | Is Action Likely to Adversely Affect Species | Is Action Likely to Adversely Affect Critical Habitat? | Is Action Likely To Jeopardize the Species? | Is Action Likely To Destroy or Adversely Modify Critical Habitat? |
|---|---|---|---|---|---|
| Steller Sea Lion, Western DPS (*Eumetopias jubatus*) | Endangered | No | No | No | No |
| Humpback Whale, Western North Pacific DPS (*Megaptera novaeangliae*) | Endangered | No | No | No | N/A |
| Humpback Whale, Mexico DPS (*Megaptera novaeangliae*) | Threatened | No | No | No | N/A |
| Fin Whale (*Balaenoptera physalus*) | Endangered | No | No | No | N/A |
| Blue Whale (*Balaenoptera musculus*) | Endangered | No | No | No | N/A |
| Bowhead Whale (*Balaena mysticetus*) | Endangered | No | No | No | N/A |
| North Pacific Right Whale (*Eubalaena japonica*) | Endangered | No | No | No | No |
| Sperm Whale (*Physeter macrocephalus*) | Endangered | No | No | No | N/A |
| Ringed Seal, Arctic subspecies (*Phoca hispida hispida*) | Threatened | No | No | No | N/A |
| Bearded Seal, Beringia DPS (*Erignathus barbatus*) | Threatened | No | No | No | N/A |

**Consultation Conducted By:** National Marine Fisheries Service, Alaska Region

**Issued By**: for James W. Balsiger, Ph.D.
Regional Administrator

**Date**: October 18, 2019

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# TERMS AND ABBREVIATIONS

| | |
|---|---|
| µPa | Micro Pascal |
| AIS | Automated Information System |
| AKR | Alaska Region |
| ANWR | Arctic National Wildlife Refuge |
| ASAMM | Aerial Surveys of Arctic Marine Mammals |
| ASLC | Alaska SeaLife Center |
| BA | Biological Assessment |
| bbl | barrels |
| BLM | Bureau of Land Management |
| BMP | Best Management Practice |
| BOEM | Bureau of Ocean Energy Management |
| cm | centimeter |
| $CO_2$ | Carbon dioxide |
| CPF | Central Processing Facility |
| CWA | Clean Water Act |
| dB re 1µPa | Decibel referenced 1 microPascal |
| DPS | Distinct Population Segment |
| EEZ | Exclusive Economic Zone |
| EIS | Environmental Impact Statement |
| ESCA | Endangered Species Conservation Act |
| EPA | Environmental Protection Agency |
| ESA | Endangered Species Act |
| FEIS | Final Environmental Impact Statement |
| FMP | Fishery Management Plan |
| ft | feet |
| GP | General Permit |
| Hz | hertz |
| IHA | Incidental Harassment Authorization |
| in | inches |
| ITS | Incidental Take Statement |
| kHz | kilohertz |
| km | kilometer |
| $L_E$ | cumulative sound exposure level |
| LOA | Letter of Authorization |
| m | meter |
| mi | mile |
| MMPA | Marine Mammal Protection Act |
| MTR | Marine Transit Route |
| NEPA | National Environmental Policy Act |
| NMFS | National Marine Fisheries Service |
| NPDES | National Pollutant Discharge Elimination System |
| NSO | no surface occupancy |
| OCS | Outer Continental Shelf |
| PBF | physical or biological feature |
| PCE | primary constituent element |
| PK | peak sound level |

| | |
|---|---|
| ppm | parts per million |
| PSO | protected species observer |
| PTS | permanent threshold shift |
| RFD | reasonably foreseeable development |
| rms | root mean square |
| ROD | Record of Decision |
| ROP | Required Operating Procedure |
| RP | response plan |
| RPA | reasonable and prudent alternative |
| SA | stranding agreement |
| SSV | sound source verification |
| TTS | temporary threshold shift |
| USFWS | US Fish and Wildlife Service |
| WDPS | Western DPS |
| WNP | Western North Pacific |

# 1. INTRODUCTION

Section 7(a)(2) of the Endangered Species Act of 1973, as amended (ESA; 16 U.S.C. §1536(a)(2)) requires each Federal agency to ensure that any action it authorizes, funds, or carries 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 with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR §402.14(a)). Federal agencies may fulfill this general requirement informally if they conclude that an action may affect, but "is not likely to adversely affect" endangered species, threatened species, or designated critical habitat, and NMFS or the USFWS concurs with that conclusion (50 CFR §402.14(b)).

In this document, the action agency is Department of Interior's Bureau of Land Management (BLM), which proposes to implement an oil and gas leasing program in the Arctic National Wildlife Refuge Coastal Plain over an 85 year period beginning within one year of the Record of Decision for the Coastal Plain Oil and Gas Leasing Program Environmental Impact Statement. The consulting agency for this proposal is NMFS's Alaska Region. This document represents NMFS's programmatic biological opinion (opinion) on the effects of this proposed action on endangered and threatened species and designated critical habitat.

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide an opinion stating how the Federal agency's action is likely to affect ESA-listed species and their critical habitat. If incidental take is reasonably certain to occur, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking, specifies those reasonable and prudent measures necessary or appropriate to minimize such impact, and sets forth terms and conditions to implement those measures. However, per NMFS's regulation, 50 CFR §402.14(i)(6) and §402.02, an ITS is not required at the programmatic level for framework programmatic actions where information on the specific number, location, timing, frequency, and intensity of actions is unknown; and any incidental take resulting from any actions subsequently authorized, funded, or carried out under the program will be addressed in subsequent ESA section 7 consultations. A framework programmatic action evaluates the effects of an agency policy or program and approves that policy or program as a framework for the development of future actions that are authorized, funded, or carried out at a later time; any take of a ESA-listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further section 7 consultation (50 CFR 402.02).

The agency program addressed in this framework programmatic opinion is leasing of the Arctic National Wildlife Refuge (ANWR) Coastal Plain (formerly known as the 1002 Area). While a lease sale alone will not affect listed marine mammals, associated seismic exploration to determine lease viability, and the subsequent phases of exploration, development, production, and abandonment and reclamation of leased blocks may affect listed species and designated critical habitat and is expected to require subsequent consultation to be initiated by BLM.

Accordingly, while this opinion considers effects from the entire program (leasing through reclamation), consultation also will be required for all future activities related to this program that may affect listed species, and for each subsequent consultation NMFS will determine whether a future activity under this program is or is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habitat of such species. At each phase of this program, project-specific information provided by potential lessees (such as a Development Plan) will aid in the assessment of effects on listed species and the amount and extent of incidental take resulting from that project. Project-specific information also will aid in the development of sufficiently specific and meaningful reasonable and prudent measures and terms and conditions for each project and will ensure an accurate and reliable trigger for reinitiation of consultation (80 FR 26832, 26835-36; May 11, 2015). For these reasons, NMFS is not including an ITS with this opinion.

This is a framework programmatic consultation per 50 CFR §402.02 with the first phase starting after the signing of the Record of Decision (ROD) consisting of leasing activities including the two lease sales, seismic exploration, and other activities (years 1-6; Table 1), and future phases consisting of development, production, and abandonment and reclamation activities (years 7-85) associated with the lease blocks covering at least 800,000 acres of the highest hydrocarbon potential lands (up to 1,563,500 acres total) within the Coastal Plain. While the proposed action focuses on the first phase, we also consider potential impacts through the endpoint of the action (i.e., abandonment and reclamation activities).

The opinion was prepared by NMFS in accordance with section 7(b) of the ESA (16 U.S.C. 1531-1544), and implementing regulations at 50 CFR part 402.

The opinion is in compliance with the Data Quality Act (44 U.S.C. 3504(d)(1) *et seq*.) and underwent pre-dissemination review.

### 1.1 Background

This opinion considers the effects of the proposed action presented by BLM, which aligns with their preferred alternative (Alternative B) in the Coastal Plain Oil and Gas Leasing Program EIS (DOI 2019). The preferred alternative identifies a lease sale under the Reasonably Foreseeable Development (RFD) Scenario in which the entire program area (~1,563,500 acres) could be offered for lease sale with the fewest acres with No Surface Occupancy (NSO) stipulations. BLM's proposed action analyzed the RFD under the least restrictive and potentially most impactful alternative to resources (BLM 2019). The proposed action represents the most likely scenario for oil exploration, development, production, and abandonment. The activities associated with these phases have the potential to affect the endangered bowhead whale (*Balaena mysticetus*), endangered humpback whale (Western North Pacific (WNP) DPS and Mexico DPS; *Megaptera novaeangliae*), endangered fin whale (*Balaenoptera physalus*), endangered blue whale (*Balaenoptera musculus*), endangered North Pacific Right Whale (*Eubalaena japonica*), endangered sperm whale (*Physeter macrocephalus*), threatened Arctic subspecies of ringed seal (*Phoca hispida hispida*), threatened Beringia DPS of bearded seal (*Erignathus barbatus nauticus*), and endangered western DPS (WDPS) Steller sea lion (*Eumetopias jubatus)*. These actions may also affect critical habitat for Steller sea lions and North Pacific right whales.

This opinion is based on information provided in the Biological Assessment (BA) for the

Implementation of the Oil and Gas Lease Sales for the ANWR Coastal Plain by BLM (May 14, 2019), draft and final environmental impact statements for the Coastal Plain Oil and Gas Leasing Program, clarifying emails and telephone conversations between NMFS and BLM, and other sources of information. A complete record of this consultation is on file at NMFS's Anchorage, Alaska office.

### 1.2 Consultation History

On February 13, 2019, BLM submitted a request for ESA consultation to NMFS regarding its determination of the impacts of this Coastal Plain leasing project on ESA listed species and their critical habitat. Following a request for additional information, NMFS received the final BA (BLM 2019) from BLM that included the additional information on May 14, 2019. During that time, NMFS and BLM also held two phone calls to clarify requested information and follow up on mitigation measures, which occurred on April 12, 2019, and May 6, 2019. NMFS deemed the initiation package complete and initiated consultation on May 16, 2019.

## 2. DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

### 2.1 Proposed Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). "Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02).

This opinion considers the effects of the first phase of establishment and administration of an oil and gas program for the leasing, development, production, and transportation of oil and gas in and from the Coastal Plain area of the Arctic National Wildlife Refuge. Pursuant to Public Law 115-97, BLM is required to hold at least two lease sales by December 22, 2024, for at least 400,000 acres each of the highest hydrocarbon-potential lands within the Coastal Plain, allowing for up to 2,000 surface acres of Federal land to be covered by production and support facilities. Further activities in the first and future project phases are described below. Future actions, such as proposed exploration plans and development proposals, require additional NEPA analysis and ESA Section 7 consultation.

Specifically, this opinion analyzes the effects from the following exploration activities:

- aircraft noise,
- a seawater treatment facility,
- vibroseis surveys,
- a marine vessel transit route, and
- a barge landing area.

Activities that are expected to occur in the future include construction of a Central Processing Facility (CPF) in the development phase seven years after the lease sale, production from an anchor pad and additional construction of satellite pads eight years after the first lease sale, an increase in production through year 40 after completion of all wells on the anchor and satellite pads, development of additional fields from 11 to 85 years after the first lease sale, and then abandonment and reclamation in 19 to 85 years after the first lease sale. Abandonment and reclamation require plugging wells that are no longer economically productive, removal of equipment, digging up gravel pads and roads, and reclamation of the area (Table 1).

Analyses in this opinion cover from year 1 through year 85. The majority of the analyses in the biological evaluation (BLM 2019) pertained to the first six years. However, NMFS is required to analyze the entire agency action and its effects through the end of the action. Because the BA provided little detail about the development, production, and abandonment phases after year six, NMFS makes the following assumptions:

- Vessel traffic of two trips a year during exploration will continue through development. It will decrease to one trip annually during production, but then increase again to two trips annually during abandonment and reclamation. Vessels will be used to bring large pieces of machinery to the Coastal Plain. After the Central Processing Facility is built, an airfield will replace much of the need for barges. One vessel trip annually during production is expected if large equipment fails and thus a barge is needed. Two trips during decommissioning is expected for shipping large equipment from the area, although the assumption is that predominantly planes will be used until the airstrip itself is reclaimed.
- Barges are pushed to the barge landing site on the Coastal Plain and then pulled away, with maneuvering done in deep water away from the coast.
- Vibroseis surveys will only occur during exploration in the first six years, i.e. during phase 1.

### 2.1.1 Proposed Activities

The proposed activities to be covered by this biological opinion include area-wide 3D seismic exploration (i.e. vibroseis surveys), the marine transit route for barges to bring equipment to and from a barge landing site on the Coastal Plain, and development of a seawater treatment facility to supply water for construction of terrestrial ice-roads, reservoir pressure support, or other subsurface uses. Development of the drilling sites is not expected to affect listed species under NMFS's jurisdiction because the central processing facility and drilling sites are expected to be inland from the marine and coastal environment as proposed by BLM.

<u>Seismic Surveys</u>

The first lease sale will occur within the first year after the ROD, and a second one by 2024. The entire federal Coastal Plain, including the coastline out into marine waters to the 10 foot bathymetry line, could be subject to a 3D seismic survey and subsequent smaller scale surveys of their own lease blocks by companies after the sales. The survey requires winter travel by vibroseis seismic vehicles and smaller support vehicles. Vibroseis trucks are mounted on rubber tracks to minimize ground pressure. No air-guns or dynamite are expected to be used. Multiple vehicles could be used simultaneously miles apart to conduct vibroseis exploration, or convoys of four to five trucks could travel in a line, which is less common. BLM will make its approval of any seismic survey activity with the potential to take a marine mammal (whether conducted pre- and post-lease sale) contingent upon the applicant having a valid MMPA incidental take authorization from NMFS, and thus we expect any future federal actions that may affect ESA-listed marine mammals will undergo additional consultation.

Exploratory Drilling

Exploration wells would be drilled onshore in the winter using an ice road to allow transportation of a drilling rig. The primary action associated with exploration wells that NMFS must analyze is the landing of equipment in the coastal area. Wells will be drilled at least two miles from the coast per the BLM lease stipulation regarding No Surface Occupancy restrictions (Mitigation Measures). Following a promising discovery in an exploration well, delineation wells will be drilled to further characterize the discovery, also more than two miles inland. These wells require similar resource commitments and require about the same time for drilling as an initial exploration well. After drilling, logging, and other downhole evaluation activities are complete, exploration and delineation wells may either be completed and suspended for future use or plugged and abandoned according to regulatory requirements, with all wastes removed from the site (DOI 2005).

Seawater Treatment Facility

A seawater treatment facility could be constructed along the coast if needed. However, groundwater aquifers or local lakes are typically preferred water sources due to cost and maintenance requirements of a seawater desalination plant. Those may not be sufficient to meet water needs, so BLM included a potential for a desalination plant in its BA. Construction and operation of the plant would require at least 15 acres of surface disturbance, plus a road and seawater transport pipeline. Gravel roads typically require 7.5 acres of surface disturbance per mile. Per Lease Notice 2, BLM will make its approval of any development activity with the potential to take a marine mammal contingent upon the applicant having a valid MMPA incidental take authorization from NMFS, and thus we expect any future federal actions that may affect ESA-listed marine mammals will undergo additional consultation.

Transportation

Transportation of supplies and personnel will occur via different means depending on seasonal constraints and phase of operations. Aircraft (fixed wing and helicopters) will be the primary form of transportation year round. Ice roads and trails also will be used. Lastly, barges will be used for at least one transit during the open water season (July-October) to bring in heavy equipment and other materials for construction. The marine transit route (MTR) will be along an established shipping route between Dutch Harbor and the Coastal Plain.

**Table 1. Estimated hypothetical development time frames for the Coastal Plain lease sale.**

| Project Phase | Project Description | Estimated Time Frames of Activities | Activities |
|---|---|---|---|
| First | Three-dimensional (3D) seismic exploration | Within the next 2 years | Area-wide 3D seismic exploration. |
| First | Leasing | Within 1 year of ROD | First lease sale. |

| Project Phase | Project Description | Estimated Time Frames of Activities | Activities |
|---|---|---|---|
| First | Exploration | Within 2 years after first lease sale (winter) | • First application for permit to drill submitted for exploration well.<br>• First exploration well drilled Assumes discovery with first exploration well. |
| First | Additional seismic exploration | Within 3 years after first lease sale (winter) | • Seismic exploration on lease block with discovery to locate future delineation exploration wells.<br>• Process seismic data and determine location of delineation wells to be drilled the following winter. |
| First | Additional exploration wells | 4 years after first lease sale (winter) | Drill 3 to 5 additional wells to define the prospect and identify satellite pad locations. |
| First | Master development plan and EIS | 5 to 6 years after first lease sale | • Continue drilling 2 to 3 exploration wells to identify CPF and satellite pad locations. |
| Future | | | • Conduct NEPA analysis on master development plan for anchor field. |
| Future | Development | 7 years after first lease sale | • Begin laying gravel for anchor pad, begin CPF construction.<br>• Continue drilling 2 to 3 exploration wells to identify satellite pad locations.<br>• Begin drilling production wells on anchor pad. |
| Future | Production begins | 8 years after first lease sale | • First production from anchor pad.<br>• Winter gravel and construction on satellite pads. |
| Future | Production increases | 9 to 40 years after first lease sale | • All wells completed on anchor pad.<br>• All wells completed on satellite pads. |
| Future | Development of additional fields | 11 to 85 years after first lease sale | • Construct facilities and drill wells in additional fields.<br>• Production continues for approximately 35 years after reaching peak production in each field. |
| Future | Abandonment and reclamation | 19 to 85 or more years after first lease sale | • Plug wells that are no longer economically productive.<br>• Remove retired equipment, dig up vacant gravel pads and roads and reclaim the area. |

### 2.1.2 Mitigation Measures

At the lease sale stage, mitigation measures typically include lease stipulations; post-lease activities may have mitigation measures imposed through conditions of approval of plans, permit conditions, or other mechanisms. Leaseholders and other permittees routinely request, and are expected to obtain, authorizations, including MMPA incidental take authorization from NMFS for activities that could result in the take of marine mammals under the MMPA. As specific projects are proposed in this multi-phase oil and gas program, more precise information about the nature and extent of the activities - including the number, timing, scale, frequency, intensity, and location of the activities and a description of the particular technologies to be employed - will be considered and evaluated in additional ESA consultations and other analyses (e.g., NEPA and MMPA) as appropriate. Through this multi-phase process, a dynamic and robust analysis of the potential effects of oil and gas activities is ensured, and additional mitigation measures and protections may be developed at any stage based on the specific details of the particular proposed projects.

Lease stipulations become contractual obligations the lessee must follow. While BLM outlined several stipulations in its BA, the following are those pertinent to this opinion.

2.1.2.1 BLM-Required Lease Stipulations

1. **Nearshore marine, lagoon, and barrier island habitats of the Southern Beaufort Sea within the boundary of the Arctic Refuge.**
   Objective: Protect fish and wildlife habitat, including that for waterfowl and shorebirds, caribou insect relief, marine mammals, and polar bear summer and winter coastal habitat; preserve air and water quality; and minimize impacts on subsistence activities, recreation, historic travel routes, and cultural resources on the major coastal water bodies.
   Restriction: This stipulation subjects lessees to "no surface occupancy" (NSO) restrictions in which exploratory well drill pads, production well drill pads, or a central processing facility for oil or gas would not be permitted in coastal waters, lagoons, or barrier islands within the boundaries of the Coastal Plain.

2. **Coastal Area.**
   Objective: Protect coastal waters, lagoons, barrier islands, shorelines, and their value as fish and wildlife habitat, including for waterfowl, shorebirds, and marine mammals; minimize the hindrance or alteration of caribou movement in caribou coastal insect-relief areas; minimize hindrance or alteration of polar bear use and movement in coastal habitats; protect and minimize disturbance from oil and gas activities to coastal habitats for polar bears and seals; prevent loss and alteration of important coastal bird habitat; and prevent impacts on coastal subsistence resources and activities.
   Restriction: This stipulation protects coastal waters, lagoons, barrier islands, shorelines, and their value as fish and wildlife habitat, including for waterfowl and marine mammals, by minimizing disturbance from oil and gas activities to coastal habitats for polar bears and preventing loss and alteration of important coastal bird habitat. Lessees will develop and implement an impact and conflict avoidance and monitoring plan to assess, minimize, and mitigate the effects of the infrastructure and its use on these coastal habitats and their use by wildlife for operations occurring within 2 miles from the coast.

2.1.2.2 BLM Required Operating Procedures

Required operating procedures (ROPs) describe the protective measures that the BLM would impose on applicants during the permitting process. At the permitting stage, the BLM Authorized Officer would not include those ROPs that, because of their location or other inapplicability, are not relevant to a specific permit application. Below, with respect to exploration, mitigation measures and typical monitoring protocols for seismic operations are addressed first, and then mitigation measures associated with exploratory and delineation drilling are presented. Mitigation measures for vessel, aircraft, and terrestrial vehicle operations and onshore development activities, are also presented.

Relevant ROPs that would directly or indirectly minimize or mitigate effects on listed species or their critical habitat managed by NMFS are described below:

***Required Operating Procedure 2***
Objective: Minimize impacts on the environment by reducing the attraction, particularly bears, to human use areas. Requirement/Standard: Lessee/operator/contractor would prepare and implement a comprehensive waste management plan for all phases of exploration, development, and production, including seismic activities. The plan would include methods and procedures to use bear resistant containers for all waste materials.

***Required Operating Procedure 17***
Objective: Minimize surface impacts from exploratory drilling.

***Required Operating Procedure 21***
Objective: Minimize impacts of the development footprint. Requirement/Standard: Facilities would be designed and located to minimize the development footprint and impacts on other purposes of the Arctic Refuge.

***Required Operating Procedure 24***
Objective: Minimize the impact of mineral materials mining on air, land, water, fish, and wildlife resources. Requirement/Standard: Gravel mine site design and reclamation would be done in accordance with a plan approved by the BLM Authorized Officer.

***Required Operating Procedure 28***
Objective: Use ecological mapping as a tool to assess wildlife habitat before developing permanent facilities to conserve important habitat types. Requirement/Standard: An ecological land classification map of the area would be developed before approval of facility construction.

***Required Operating Procedure 34***
Objective: Minimize the effects of low-flying aircraft on wildlife, subsistence activities, local communities, and recreationists of the area, including hunters and anglers.
Requirement/Standard: The operator would ensure that operators of aircraft used for permitted oil and gas activities and associated studies maintain altitudes according to the following guidelines:

a. Land users would submit an aircraft use plan as part of an oil and gas exploration or development proposal, which includes a plan to monitor flights and includes a reporting system for subsistence hunters to easily report flights that disturb subsistence harvest. The number of takeoffs and landings to support oil and gas operations with necessary materials and supplies would be limited to the maximum extent possible. During the design of proposed oil and gas facilities, larger landing strips and storage areas would be considered to allow larger aircraft to be used, resulting in fewer flights to the facility.

e. Pursuing running wildlife is hazing. Hazing wildlife by aircraft pilots is prohibited, unless otherwise authorized. If wildlife begins to run as an aircraft approaches, the aircraft is too close and the operator must break away.

***Required Operating Procedure 46***

Objective: Minimize impacts on marine mammals from vessel traffic.

Requirement/Standard:

I. General Vessel Traffic

a. Operational and support vessels will be staffed with dedicated PSOs to alert crew of the presence of marine mammals and to initiate adaptive mitigation responses.
b. When weather conditions require, such as when visibility drops, support vessel operators must reduce speed and change direction, as necessary (and as operationally practicable), to avoid the likelihood of injuring marine mammals.
c. The transit of operational and support vessels is not authorized before July 1. This operating condition is intended to allow marine mammals the opportunity to disperse from the confines of the spring lead system and minimize interactions with subsistence hunters. Exemption waivers to this operating condition may be issued by the NMFS and USFWS on a case-by-case basis, based on a review of seasonal ice conditions and available information on marine mammal distributions in the area of interest.
d. The transit route for the vessels will avoid NMFS-identified, known fragile ecosystems.
e. Vessels may not be operated in such a way as to separate members of a group of marine mammals from other members of the group.
f. Operators will take reasonable steps to alert other vessel operators in the vicinity of marine mammals.
g. Operators will report any dead or injured listed marine mammals to NMFS (contact information is in #10 of Additional Mitigation Measures below) and the USFWS.
h. Vessels will not allow tow lines to remain in the water when not towing, all closed loops will be cut, and all trash will be retained on board for disposal in secure landfills, thereby reducing the potential for marine mammal entanglement.
i. The lessees will implement measures to minimize risk of spilling hazardous substances. These measures will include: avoiding operation of watercraft in the presence of sea ice to the extent practicable and using fully-operational vessel navigation systems composed of radar, chart plotter, sonar, marine communication systems, and satellite navigation receivers, as well as Automatic Identification System (AIS) for vessel tracking.

2.1.2.3 Additional Mitigation Measures

The following mitigation measures specifically refer to vessel traffic in the vicinity of whales and Steller sea lions as well as relevant critical habitat.

Vessels in Vicinity of Whales

a. Vessel operators should avoid groups of 3 or more whales by staying at least 1 mile away. A group is defined as being three or more whales observed within a 500-m (1641-ft) area and displaying behaviors of directed or coordinated activity (e.g., group feeding).

b. All boat and barge traffic will be scheduled to avoid periods when bowhead whales are migrating through the area. Boat, hovercraft, barge, and aircraft will remain at least 20 km from Cross Island during the bowhead whale subsistence hunt consistent with the Conflict Avoidance Agreement (CAA).

c. The transit of operational and support vessels through the North Slope region is not authorized prior to July 1. This operating condition is intended to allow marine mammals the opportunity to disperse from the confines of the spring lead system and minimize interactions with subsistence hunters. Exemption waivers to this operating condition may be issued by NMFS and USFWS on a case-by-case basis, based upon a review of seasonal ice conditions and available information on marine mammal distributions in the area of interest.

d. If the vessel approaches within 1 mile of observed whales, except when providing emergency assistance to whalers or in other emergency situations, the operator will take reasonable precautions to avoid potential interaction with the whales by taking one or more of the following actions, as appropriate:

   i. Reducing vessel speed to less than 5 knots within 300 yards of the whale.

   ii. Steering to the rear of the whale if possible.

   iii. Reducing vessel speed to 5 knots or less when weather conditions reduce visibility to 0.5 miles or less to avoid the likelihood of injury to whales.

   iv. Vessels shall not exceed speeds of 10 knots when visibility exceeds 0.5 miles to reduce potential whale strikes.

   v. If a whale approaches the vessel and if maritime conditions safely allow, the engine will be put in neutral and the whale will be allowed to cross the intended path of the vessel and/or travel beyond 50 m from the vessel. If the vessel is taken out of gear, vessel crew will ensure that no whales are within 50 m of the vessel when propellers are re-engaged, thus minimizing risk of marine mammal injury.

e. If the vessel has stopped for any reason, the operator will, prior to resuming travel, ensure no whales are within 50 m of the vessel prior to engaging the propellers.

f. Vessels will stay at least 300 m away from cow-calf pairs, feeding aggregations, or whales that are engaged in breeding behavior. If the vessel is approached by cow-calf pairs, it will remain out of gear as long as whales are within 300 m of the vessel (consistent with safe operations).

g. Consistent with NMFS marine mammal viewing guidelines (https://alaskafisheries.noaa.gov/pr/mm-viewing-guide), operators of vessels will, at all times, avoid approaching marine mammals within 100 yards. Operators will observe direction of the whale's travel and attempt to maintain a distance of 100 yards or greater between the animal and the vessel by working to alter course or slowing the vessel.

h. Special consideration of North Pacific right whale and their critical habitat:

i. Vessel operators will avoid transit through North Pacific right whale critical habitat. If such transit cannot be avoided, operators must post a dedicated PSO on the bridge and reduce speed to 10 knots while in North Pacific right whale critical habitat. Alternately, vessels may transit at no more than 5 knots without the need for a dedicated PSO.

ii. Vessel operators will remain at least 800 m from all North Pacific right whales and avoid approaching whales head-on, consistent with vessel safety.

iii. Operators will maintain a ship log indicating the time and geographic coordinates at which vessels enter and exit North Pacific right whale critical habitat, as well as coordinates for all North Pacific right whale sightings.

iv. See Section 9c below (Data Collection and Reporting: North Pacific Right Whale Reporting) for specific reporting requirements.

Vessel Transit Through Steller Sea Lion Critical Habitat/Near Major Rookeries and Haulouts

Vessels will remain 3 nautical miles (nm; 5.5 km) from all Steller sea lion rookery sites listed in 50 CFR 224.103(d)(1)(iii) and major haulouts around which critical habitat has been designated (see 50 CFR 226.202). The vessel operator will not approach within 3 nautical miles (nm; 5.5 km) of any major Steller sea lion rookery or haulout unless doing so is necessary to maintain safe conditions.

The following mitigation measures have typically been included in recent consultations for oil and gas activities in the US Arctic. If these measures (or alternate measures that are more protective of listed species) are not incorporated in future actions by BLM's lessees or permittees (or their agents) through the MMPA permitting process, ESA consultation, or otherwise, BLM will reinitiate consultation on this action.

1. **Shallow, Nearshore, Open-water Activities (i.e., barge landing)**
   a) If marine mammals enter within 100 yards of the barge landing area prior to or during deploying the vessel or equipment, all activity in the vicinity of the marine mammals will stop and will not resume until marine mammals are at least 100 yards from the vessel/equipment.

2. **Nearshore Seismic Activities (vibroseis)[1]**
   a) Prior to the start of vibroseis operations, the operator will conduct a sound source verification (SSV) test to measure the distance to attenuate vibroseis sound levels through grounded ice to the 120dB re 1 μPa threshold in open water and water within ungrounded ice. Once the distance to the 120 dB threshold has been determined, it will be shared with the BLM Authorized Officer (AO) and NMFS. All subsequent vibroseis operations will maintain at least this distance from open water or ungrounded ice. The operator will draft a formal study proposal for vibroseis SSV

[1] These mitigation measures will apply to nearshore seismic activities conducted pre-lease sale and post-lease sale.

that will be submitted to the BLM and the NMFS for review and approval six weeks before operations begin.

b) Ensure airborne sound levels of equipment remain below 100 dB re 20 μPa at 20 meters. If different equipment would be used than was originally proposed, lessee must inform the AO and share sound source level and air and water attenuation information for the new equipment.

c) Operations after May 1 will employ a full-time protected species observer (PSO) on all vibroseis vehicles to ensure all basking seals will be avoided by vehicles. Vehicles will remain at least 500 feet from observed seals. Any sightings of basking seals will require a 500-foot buffer be placed around the location, and the location will be reported to the AO using a NMFS-approved observation form. A draft form will be provided to NMFS for review and approval six weeks before operations begin.

d) All seismic work is restricted to areas with the 10 foot bathymetric line. All vehicle operations on sea ice will take place on grounded ice, with the exception of snow machines to set and retrieve recorders. On ungrounded ice, snow machine ice paths must not be greater than 3 feet wide. No driving for all vehicles beyond the edges of the ice path or off of planned routes will be allowed unless necessary to avoid ungrounded ice or for other human or marine mammal safety reasons.

e) No unnecessary equipment or operations (e.g. camps) will be located on ungrounded sea ice or within the 120 dB isopleth specified in mitigation measure 2.a. In addition, no equipment will be operated within 500 feet of basking seals as identified in mitigation measure 2.c.

f) A NMFS and BLM approved training session for all staff will be held prior to workers entering the field. The training will cover seal identification, biology, and status; seal lair descriptions; snow/ice/topographical factors that lead to birthing lair development; minimizing driving over such areas; and all applicable mitigation measures.

**3. Protected Species Observer Requirements**

a) PSOs will have the following prior experience and skills:

1) Be in good physical condition and be able to withstand harsh weather conditions for an extended period of time;

2) Must have vision correctable to 20-20;

3) Be able to sufficiently conduct field observations and data collection according to assigned protocols;

4) Writing skills sufficient to prepare understandable reports of observations and technical skills to complete data entry forms accurately; and

5) Ability to identify marine mammals in Alaskan waters to species.

b) PSOs will complete project specific training prior to deployment to the project site (taught by an experienced trainer following a course syllabus approved by NMFS). This course will include:

   1) Training in field identification of marine mammals and marine mammal behavior;

   2) Overview of ecological information on Alaska's marine mammals and specifics on the ecology and management concerns of those marine mammals;

   3) Instruction on ESA and MMPA regulations;

   4) Review of mitigation measures outlined in this opinion;

   5) Instruction in proper equipment use;

   6) Instruction in methodologies in marine mammal observation and data recording and proper reporting protocols; and

   7) PSO roles and responsibilities.

c) PSOs will work in shifts lasting no longer than 4 hours with at least a 1-hour break from marine mammal monitoring duties between shifts. PSOs will not perform PSO duties for more than 12 hours in a 24 hour period (to reduce fatigue). Note that during the 1-hour break for a PSO, a crew member can be assigned to be the observer as long as they do not have other duties at that time and they have received instructions and tools to allow them to make marine mammal observations.

d) PSOs will have the ability to effectively communicate orally, by radio and in person, with project personnel to provide real-time information on marine mammals.

e) PSOs will have the ability and authority to order appropriate mitigation response to avoid takes of all marine mammals.

f) The PSOs will have the following equipment to address their duties:

   1) Range finder;

   2) Annotated chart and compass;

   3) Inclinometer;

   4) Two-way radio communication, or equivalent, with onsite project manager;

   5) Appropriate personal protective equipment;

   6) Daily tide tables for the project area;

   7) Watch or chronometer;

   8) Binoculars (7x50 or higher magnification) with built-in rangefinder or reticles (rangefinder may be provided separately);

   9) Handheld global positioning system;

   10) A copy of this opinion and all appendices, printed on waterproof paper and bound; and

11) Observation Record forms printed on waterproof paper, or weatherproof electronic device allowing for required PSO data entry.

g) PSOs will have no other primary duties beyond watching for, acting on, and reporting events related to marine mammals.

h) Prior to commencing in-water work or prior to changes in watch, PSOs should establish a point of contact with the construction crew. The PSO will brief the point of contact as to the shutdown procedures if marine mammals are observed likely to enter or within the shutdown zone, and shall request that the point of contact instruct the crew to notify the PSO when a marine mammal is observed. If the point of contact goes "off shift" and delegates his duties, the PSO must be informed and brief the new point of contact.

**4. Aircraft**

a) Except during takeoff and landing and in emergency situations, all aircraft will transit at an altitude of 1,500 feet or higher while maintaining Federal Aviation Administration flight rules (e.g., avoidance of cloud ceiling, etc.). If flights must occur at altitudes less than 1,500 feet due to environmental conditions, aircraft will make course adjustments, as needed, to maintain at least a 1,500 foot horizontal separation from all observed marine mammals.

b) Helicopter flights should be limited to prescribed transit corridors. Helicopters shall not hover or circle above or within 457 m (1,500 ft) of groups of marine mammals.

c) If ice over-flights or similar repeated aerial surveys are conducted, a PSO shall be stationed aboard all flights and will document all marine mammal sightings.

d) Aircraft traffic will avoid flying over polynyas (open-water surrounded by ice) and along adjacent ice margins as much as possible to minimize potential disturbance to whales.

e) Air traffic will remain at least 1 nautical mile from groups of 5 or more marine mammals.

f) Aircraft will not land on ice within 1 nautical mile of hauled out pinnipeds.

**5. Arctic Specific Mitigation Measures**

a) Bowhead Whale Specific Mitigation Measures

1) Activities which produce underwater noise likely to be above the threshold for harassment will not occur during the bowhead whale subsistence hunting season (August 25 through end of hunt).

2) Air traffic will be scheduled to avoid periods when bowhead whales are migrating through the area where they may be affected by noise.

b) Monitoring and Mitigating the Effects of Onshore Facility Construction

1) All activities must be conducted at least 150 m (500 ft) from any observed ringed seal lair.

a. Travel between a mobile camp and work site shall be accomplished by having vehicles drive on a snow road during transit whenever possible; building ice roads for transit will be minimized as much as is safely possible. Vehicles must avoid pressure ridges, ice ridges, and ice deformation areas where seal structures are likely to be present.

## 6. Ice Trails Best Management Practices

### a) Best Management Practices Introduction and Definitions

**Sea Ice Trail:** a route across sea ice created, used, and maintained by equipment such as Tuckers, PistenBullys, snow machines or similar tracked equipment. Sea ice trails do not require seawater flooding.

These BMPs and monitoring activities are organized into the following categories:
Section 1: Wildlife Training
Section 2: General BMPs Implemented throughout the Ice Road/Trail Season
Section 3: BMPs Implemented Before **March 1st**
Section 4: BMPs Implemented After **March 1st**
Section 5: Reporting

**Section 1: Wildlife Training**
Prior to initiation of sea ice road- and ice trail-related activities, project personnel associated with ice road construction, maintenance, use, or decommissioning (i.e., ice road construction workers, surveyors, security personnel, and the environmental team) will receive annual training on these BMPs. Personnel are advised that interactions with, or approaching, any wildlife is prohibited. Annual training also includes reviewing the lessee's Wildlife Management Plan. In addition to the BMPs, other topics in the training will include:

1. Ringed Seal Identification and Brief Life History
2. Physical Environment (habitat characteristics and how to potentially identify habitat)
3. Ringed Seal Use in the Ice Road Region (timing, location, habitat use, birthing lairs, breathing holes, basking, etc.)
4. Potential Effects of Disturbance
5. Importance of Lairs, Breathing Holes, and Basking to Ringed Seals
6. Brief Summary of Applicable Laws and Regulatory Requirements include:
    a. Marine Mammal Protection Act (MMPA)
    b. Endangered Species Act (ESA)

**Section 2: General BMPs Implemented Throughout the Ice Road/Trail Season**

General BMPs will be implemented through the entire ice road/trail season including during construction, maintenance, use, and decommissioning.

1. Ice road/trail speed limits will be no greater than 45 miles per hour (mph); speed limits will be determined on a case-by-case basis based on environmental, road conditions and ice road/trail longevity considerations. Travel on ice roads and trails will be restricted to industry staff.
2. Following existing safety measures for ice roads, delineators will mark the roadway in a minimum of ¼-mile increments on both sides of the ice road to delineate the path of vehicle travel and areas of planned on-ice activities (e.g., emergency response exercises). Following existing safety measures currently used for ice trails, delineators will mark one side of an ice trail a minimum of every ¼ mile. Delineators will be color-coded, following existing safety protocol, to indicate the direction of travel and location of the ice road or trail.
3. Corners of rig mats, steel plates, and other materials used to bridge sections of hazardous ice, will be clearly marked or mapped using GPS coordinates of the locations.
4. Project personnel will be instructed that approaching or interacting with ringed seals is prohibited.
5. Personnel will be instructed to remain in the vehicle and safely continue, if they encounter a ringed seal while driving on the road.
6. If a ringed seal is observed within 150 ft of the center of an ice road or trail, the operator's Environmental Specialist will be immediately notified with the information provided in the Reporting section below.
   a) The Environmental Specialist will relay the seal sighting location information to all ice road personnel and the company's office personnel responsible for wildlife interaction, following notification protocols described in the company-specific Wildlife Management Plan. All other data will be recorded and logged.
   b) The Environmental Specialist or designated person will monitor the ringed seal to document the animal's location relative to the road/trail. All work that is occurring when the ringed seal is observed and the behavior of the seal during those activities will be documented until the animal is at least 150 ft away from the center of the road/trail or is no longer observed.
   c) The Environmental Specialist or designated person will contact appropriate state and federal agencies as required (see company-specific Wildlife Plans for notification details).

**Section 3: BMPs Implemented Prior To March 1$^{st}$**

Winter sea ice road/trail construction and use will begin prior to March 1$^{st}$ (typically December 1$^{st}$ through mid-February), before the time when female ringed seals establish birth lairs. Prior to establishing lairs, ringed seals are mobile and are expected to generally avoid the ice roads/trails and construction activities.

Other on-ice activities occurring prior to March 1st could also include spill training exercises, pipeline surveys, snow clearing, and work conducted by other snow vehicles such as a PistenBullys, snow machines, or rollagons. Prior to March 1st, these activities could occur outside of the delineated ice road/trail and shoulder areas.

**Section 4: BMPs Implemented After March 1st**

After March 1st, and continuing until decommissioning of ice roads/trails, the on-ice activities mentioned above (e.g., ice trail construction and maintenance, spill training exercises, and other exercises in d) can occur anywhere on sea ice where water/ice depth is less than 10 ft (i.e., habitat is not suitable for ringed seal lairs). However, if the water and ice is greater than 10 ft in depth, these activities will only occur within the boundaries of the driving lane or shoulder area of the ice road/trail.

In addition to the general BMPs, the following BMPs will also be implemented after March 1st:

1. Ice road/trail construction, maintenance, and decommissioning will be performed within the boundaries of the road/trail and shoulders. To the extent practicable and when safety of personnel is ensured, equipment will travel within the driving lane and shoulder areas.
2. Blading and snow blowing of ice roads will be limited to the previously disturbed ice road/shoulder areas to the extent safe and practicable.
3. In the event snow is accumulating on a road within a 150 ft. radius of an identified downwind seal or seal lair, operational measures will be used to avoid seal impacts, such as pushing snow further down the road before blowing it off the roadway. Vehicles will not stop within 150 ft of identified seals or within 500 ft of known seal lairs.
4. To the extent practicable and when safety of personnel is ensured, tracked vehicle operation will be limited to the previously disturbed ice trail areas. When safety requires a new ice trail to be constructed after March 1st, construction activities such as drilling holes in the ice to determine ice quality and thickness, will be conducted only during daylight hours with good visibility. Ringed seal structures will be avoided by a minimum of 150 ft during ice testing and new trail construction. Any observed ringed seal structures will be reported following BMP Section 2, #6 (General BMPs Implemented Throughout the Ice Road/Trail Season), above. Once the new ice trail is established, tracked vehicle operation will be limited to the disturbed area to the extent practicable and when safety of personnel is ensured.
5. If an ice road or trail is being used during daylight conditions with good visibility, a dedicated observer (not the vehicle operator) will conduct a survey along the sea ice road/trail to determine whether ringed seals are within 500 ft of the roadway corridor. The following survey protocol will be implemented:
   a) Surveys will be conducted every other day during daylight hours.

b) Observers for ice road activities need not be trained Protected Species Observers (PSOs), but they must have received the training described in Section 1 and have read and understand the applicable sections of the Wildlife Management Plan. In addition, they must be capable of detecting, observing and monitoring ringed seal presence and behaviors, and accurately and completely recording data.

c) Observers will have no other primary duty than to watch for and report observations related to ringed seals during this survey. If weather conditions become unsafe, the observer may be removed from the monitoring activity.

6. If a seal is observed on ice within 150 feet of the centerline of the ice road/trail, BMP Section 2, #6 (General BMPs Implemented Throughout the Ice Road/Trail Season), above, shall be initiated and:

   a) Construction, maintenance or decommissioning activities associated with ice roads and trails will not occur within 150 ft of the observed ringed seal, but may proceed as soon as the ringed seal, of its own accord, moves farther than 150 ft from the activities or has not been observed within that area for at least 24 hours. Transport vehicles (i.e., vehicles not associated with construction, maintenance or decommissioning) may continue operating within the designated road/trail provided they do not stop within 150 ft of any seal.

7. If a ringed seal structure (i.e., breathing hole or lair) is observed within 150 ft of the ice road/trail, the location of the structure will be reported to the lessee's Environmental Specialist who will then carryout notification protocol identified in BMP Section 2, #6 (General BMPs Implemented Throughout the Ice Road/Trail Season), above, and:

   a) A qualified observer (see BMP Section 4, #5 - BMPs Implemented After March 1st) will monitor the structure every six hours on the day of the initial sighting to determine whether a ringed seal is present. Monitoring for the seal will occur every other day the ice road is being used unless it is determined the structure is not actively being used (i.e., a seal is not sighted at that location during monitoring). A lair or breathing hole does not automatically imply that a ringed seal is present.

   b) Construction, maintenance, or decommissioning work will proceed following all other BMPs to minimize impacts or disturbance in the area.

**Section 5: Reporting (as indicated)**
See Section 9d (Data Collection and Reporting: Ice Seal Reporting) below for reporting requirements for ringed seal observations.

1. In the unanticipated event a seal is killed or seriously injured by ice road/trail activities, NMFS will be notified immediately (see contact information above).

2. In the event ice road/trail personnel discover a dead or injured seal but the cause of injury or death is unknown or believed not to be related to ice road/trail

activities, NMFS will be notified within 48 hours of discovery (see contact information above).

**8. Arctic Oil Spill Response**

Lessees will submit oil spill response plans (OSRPs) in accordance with appropriate agencies. The OSRP must address all aspects of oil spill response readiness, including an analysis of potential spills and spill response strategies; type, location, and availability of appropriate oil spill equipment; response times and equipment capability for the proposed activities; and response drills and training requirements.

a. In the event of an oil spill incident, the Incident Command System (ICS) will provide the on-scene management structure that guides response efforts. The responsible party (RP) will be prepared to support response efforts as part of ICS. Under the ICS structure, the operator will coordinate with the appropriate authorities within NMFS including the Regional Stranding Coordinator (RSC) or Headquarters Marine Mammal Health and Stranding Response Program (MMHSRP) staff (or their designee), to comply with the response effort in accordance with stranding agreements (SA) as described here and in NOAA's Marine Mammal Oil Spill Response Guidelines. The Alaska SeaLife Center (ASLC) is currently the only Oiled Wildlife Response Organization (OWRO) in Alaska that is permitted to clean and rehabilitate oiled wildlife under NMFS's jurisdiction:

1. Preparedness and Response Standards and Thresholds (Initial Immediate Response)

   Samples: In coordination with NMFS, Oil Spill Response Organizations (OSROs), and SA holders, the RP will be prepared to sample 50 live or dead pinnipeds (i.e., bearded seal, harbor seal, ribbon seal, ringed seal, spotted seal, northern fur seal, and/or Steller sea lion) during the first week following a spill incident, as well as prepared to sample 5 live or dead cetaceans (i.e., whales and porpoise) the first week. After the first week, the RP has the responsibility to fund the storage of carcasses, fund transport to approved facilities for analysis, and fund additional sampling or any live or dead pinnipeds or cetaceans. Sampling shall be performed by an individual or entity approved under NMFS Marine Mammal Health and Stranding Permit #18786.

   a) Necropsy: In coordination with NMFS, OSROs, and SA holders, the RP will be prepared to fund and support the necropsy 50 dead pinnipeds and/or cetaceans by individuals authorized by NMFS. Necropsies shall be performed and samples stored by an individual or entity approved under NMFS Marine Mammal Health and Stranding Permit #18786. If mortalities exceed 50 animals, the RP has the responsibility to fund the storage of carcasses and fund transport to approved facilities for analysis.

b) Sample storage: Maintain level of readiness to store 1,000 marine mammal samples, which likely includes multiple samples from individual animals, and therefore, does not represent 1,000 animals. Samples shall be stored by an individual or entity approved under NMFS Marine Mammal Health and Stranding Permit #18786.

c) Cleaning/rehabilitation threshold: The following thresholds apply for live moribund animals whose condition can withstand transport.

1) *Pinnipeds:* The RP should maintain a level of readiness for 25 live pinnipeds to be cleaned and rehabilitated in coordination with NMFS, OSROs, and SA holders.

i. This applies to bearded, ringed, ribbon, spotted, harbor, and northern fur seals and Steller sea lions. However, capturing and cleaning oiled adult Steller sea lions is generally not feasible given their size and the difficulties in their collection and transport, as well as danger to response personnel.

ii. It may not be feasible to capture oiled northern fur seals. Human safety must be a primary consideration as it may be dangerous to response personnel to capture oiled fur seal pups because of territorial bulls, and oiled adult fur seals would be extremely dangerous to handle, even if partially debilitated. Also, separating a pup from its mother temporarily may lead to abandonment.

iii. Authorized responders will use approved cleaning protocols and practices by species, which can be found in the Wildlife Protection Guidelines in the Alaska Unified Response Plan and NMFS National Marine Mammal Oil Spill Guidelines.

iv. All cleaned pinnipeds must be tagged by approved OWROs prior to release to monitor survival. Release of rehabilitated oiled wildlife will be coordinated with NMFS.

2) *Cetaceans:* The RP should maintain a level of readiness for two live small cetaceans (e.g., young beluga whale, young killer whale, or porpoise) to be cleaned and rehabilitated. As stated in NOAA Marine Mammal Response Guidelines, depending on the size and health of oiled cetaceans, euthanasia may be considered if rehabilitation is not in the best interest of the oiled animals.

2. Readiness Time Horizon

a) Maintain readiness for additional sampling, necropsies, sample storage, and cleaning/rehabilitation for up to one year post-spill.

b) After the official closure of a spill response, RPs should remain prepared to support NMFS and wildlife response organizations to respond to oil-affected marine mammals under NMFS jurisdiction.

c) Authority

1) Response authority for oiled marine mammals under NMFS jurisdiction is always retained by NMFS, and interventions can be authorized only by NMFS on a case by case basis. During a spill, authority to respond to oiled marine mammals may be granted under the NMFS Marine Mammal Health and Stranding Response Permit #18786 issued to Dr. Teri Rowles and her authorized NMFS Co-Investigators. Pre-authorization is not a component of this response structure.

2) In the future, NMFS plans to add a spill response component to language in Regional Stranding Agreements, which would allow agreement holders to respond to non-ESA listed MMPA species in the event of an oil spill. Response to ESA-listed marine mammals would still require authorization under NMFS permit #18786 as specified above.

3. Spill Response Network Model

a) Preparedness and response shall be led through a NMFS approved contractor (e.g., ASLC) under U.S. Coast Guard's OSRO program, after obtaining authorization through NMFS permit #18786. NMFS will provide guidance regarding: 1) marine mammal response standards, 2) training requirements, and 3) regulatory pathways for response authorizations (e.g., authorizing marine mammal responses pursuant to NMFS permit #18786). NMFS will maintain contact information on trained stranding network members and Incident Command System staff. NMFS-approved wildlife responders will facilitate preparedness for the stranding network as a primary field response participant, along with trained stranding network members. OSROs will need to work with NMFS-approved wildlife response organizations to ensure preparedness levels are sufficient for a rapid response to oiled marine mammal under NMFS jurisdiction. Currently, NMFS does not have the in-house capacity to lead field efforts, so will act in a guidance and oversight capacity through the Wildlife Protection Branch.

4. Adding Stranding Agreement Holders

a) NMFS will continue to approach qualified entities and individuals throughout Alaska to encourage participation and engagement in the Alaska Marine Mammal Stranding Network. A focused effort is underway to further develop response capacity in the Kodiak and Cook Inlet regions. Training will need to be provided to new stranding network members at an annual stranding network meeting or by other mechanisms.

## 9. Data Collection & Reporting

a. Data Collection

1) PSOs will record observations on data forms or into electronic data sheets, electronic copies of which will be submitted to NMFS in a digital spreadsheet or database format.

2) PSOs will use NMFS-approved Observation Records. Observation Records will be used to record the following:

   a) The date and start and stop time for each PSO shift, along with a unique PSO identifier;

   b) Date and time of each significant event ( e.g., a marine mammal sighting, operation shutdown, lair discovery);

   c) Weather parameters (e.g., percent cloud cover, percent glare, visibility) and sea state where the Beaufort Wind Force Scale will be used to determine sea-state (https://www.weather.gov/mfl/beaufort);

   d) Species, numbers, and, if possible, sex and age class of observed marine mammals, along with the date, time, and location of the observation;

   e) The predominant sound-producing activities occurring during each marine mammal sighting;

   f) Marine mammal behavior patterns observed, including bearing and direction of travel;

   g) Behavioral reactions of marine mammals just prior to, or during sound producing activities;

   h) Location of marine mammals, distance from observer to the marine mammal, and distance from the predominant sound-producing activity or activities to marine mammals;

   i) Whether the presence of marine mammals necessitated the implementation of mitigation measures to avoid acoustic impact, and the duration of time that normal operations were affected by the presence of marine mammals; and

   j) Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates must be recorded in decimal degrees, or similar standard, and defined coordinate system).

b. Vessel Collision

1) Though take of marine mammals by vessel collision is not authorized, if a listed marine mammal is struck by a vessel, it must be reported to NMFS within 24 hrs. The following will be included when reporting vessel collisions with marine mammals:

   a) Information that would otherwise be listed in the PSO Observation Record.

   b) Number and species of marine mammals involved in collision.

   c) The date, time, and location of the collision.

   d) The cause of the take (e.g., vessel strike).

   e) The time the animal(s) was first observed and last seen.

   f) Mitigation measures implemented prior to and after the animal was taken.

g) Contact information for PSO on duty at the time of the collision, ship's Pilot at the time of the collision, or ship's Captain.

c. North Pacific Right Whale (NPRW) Reporting

1) Sightings of NPRW (within or outside of NPRW critical habitat) should be reported to NMFS within 24 hours. These sighting reports will include the following information:

a) Date, time, and geographic coordinates of the sighting(s),

b) Species observed, number of animals observed per sighting event,

c) Number of adults/juveniles/calves per sighting event (if determinable), and

d) Photographs, if obtained.

2) PSOs will collect, organize, and report on vessel travel within NPRW critical habitat and marine mammal observations that occur within that critical habitat. These reports will be submitted to NMFS by the end of the calendar year during which observations were made. The end-of-year report will outline the following information:

a) Ship logs (time and location for when a vessel entered and exited North Pacific right whale critical habitat).

b) Species, date, and time for each observation.

c) Number of animals per sighting event; and number of adults/juveniles/calves per sighting event (if determinable).

d) Geographic coordinates for the observed animals, with the position recorded by using the most precise coordinates practicable (coordinates must be recorded in decimal degrees, or similar standard (and defined) coordinate system).

e) Environmental conditions as they existed during each sighting event, including sea conditions, weather conditions, visibility (km/mi), lighting conditions, and percent ice cover.

f) Documentation of vessel route through critical habitat.

g) Photographs and video obtained.

d. Ice Seal Reporting

A final end-of-season report compiling all ringed seal observations will be submitted to NMFS Alaska Region Protected Resources Division (greg.balogh@noaa.gov) and NMFS Office of Protected Resources Permits Division (jaclyn.daly@noaa.gov) within 90 days of decommissioning the ice road/trail. The report will include:

1) Date, time, location of observation.

2) Ringed seal characteristics (i.e., adult or pup, behavior [avoidance, resting, etc.]).

3) Activities occurring during observation including equipment being used and its purpose, and approximate distance to ringed seal(s).

4) Actions taken to mitigate effects of interaction emphasizing: 1) which BMPs were successful; 2) which BMPs may need to be improved to reduce interactions with ringed seals; 3) the effectiveness and practicality of implementing BMPs; 4) any issues or concerns regarding implementation of BMPs; and 5) potential effects of interactions based on observation data.

5) Proposed updates (if any) to Wildlife Management Plan(s) or BMPs.

6) Reports must be able to be queried for information.

e. Unauthorized Take

1) If a listed marine mammal is suspected of having been disturbed, harassed, harmed, injured, or killed or is observed entering the exclusion/shutdown zone before operations can be shut down, the animal/event must be reported to NMFS within one business day. These reports must include:

a) Information that must be listed in the PSO report.

b) Number of listed animals affected.

c) The date and time of each event.

d) The cause of the event.

e) The time the animal(s) entered the monitoring zone, and, if known, the time it exited the zone.

f) Mitigation measures implemented prior to and after the animal entered the monitoring zone.

f. Stranded, Injured, Sick, or Dead Marine Mammal (not associated with the project)

1) If PSOs observe an injured, sick, or dead marine mammal (i.e., stranded marine mammal), they shall notify the Alaska Marine Mammal Stranding Hotline at 877-925-7773. The PSOs will submit photos and data that will aid NMFS in determining how to respond to the stranded animal. Data submitted to NMFS in response to stranded marine mammals will include date/time, location of stranded marine mammal, species and number of stranded marine mammals, description of the stranded marine mammal's condition, event type (e.g., entanglement, dead, floating), and behavior of live-stranded marine mammals.

g. Oil Spill Response

1) In the event of an oil spill in the marine environment, the permittees shall immediately report the incident to: the U.S. Coast Guard 17th District Command Center at 907-463-2000, and NMFS AKR, Protected Resources Division Oil Spill Response Coordinator at 907-586-7630 and/or email (sadie.wright@noaa.gov).

h. Monthly Report

1) Monthly reports will be submitted via email to NMFS AKR for all months with project activities by the $15^{th}$ of the month following the monthly reporting period. For example, for the monthly reporting period of June 1-30, the monthly report

must be submitted by July 15th. The monthly report will contain and summarize the following information:

a) Dates, times, locations, heading, speed, weather, sea conditions (including Beaufort sea state and wind force), and associated activities during all project activities and marine mammal sightings.

b) Species, number, location, distance from the vessel, and behavior of any sighted marine mammals, as well as associated project activity (e.g., number of power-downs and shutdowns), observed throughout all monitoring activities.

c) An estimate of the number (by species) exposed to noise (based on visual observation) at received levels greater than or equal to the NMFS thresholds discussed above with a discussion of any specific behaviors those individuals exhibited.

d) A description of the implementation and effectiveness of the mitigation measures. For the Biological Opinion, the report must confirm the implementation of each Term and Condition, as well as any conservation recommendations, and describe their effectiveness for minimizing the adverse effects of the action on ESA-listed marine mammals.

i. Annual Report

Within 90 calendar days of the cessation of in-water and on-ice work each year, a comprehensive annual report will be submitted to NMFS AKR for review. The report will synthesize all sighting data and effort during each activity for each year. NMFS will provide comments within 30 days after receiving annual reports, and lessees must address the comments and submit revisions within 30 days after receiving NMFS comments. If no comments are received from the NMFS within 30 days, the annual report is considered completed. The report will include the following information:

1) Summaries of monitoring effort including total hours, total distances, and marine mammal distribution through the study period, accounting for sea state and other factors affecting visibility and detectability of marine mammals.

2) Analyses of the effects of various factors that may have influenced detectability of marine mammals (e.g., sea state, number of observers, fog/glare, and other factors as determined by the PSOs).

3) Species composition, occurrence, and distribution of marine mammal sightings, including date, water depth, numbers, age/size/gender categories (if determinable), group sizes, and ice cover.

4) Marine mammal observation data with a digital record of observation data provided in spreadsheet format.

5) Summary of implemented mitigation measures (i.e., shutdowns and delays).

6) Number of marine mammals during periods with and without project activities (and other variables that could affect detectability), such as: (i) initial sighting distances versus project activity at the time of sighting; (ii) closest point of

approach versus project activity; (iii) observed behaviors and types of movements versus project activity; (iv) numbers of sightings/individuals seen versus project activity; (v) distribution around the source vessels versus project activity; and (vi) numbers of animals detected in the shutdown zone(s).

7) Analyses of the effects of project activities on listed marine mammals

j. Final Report

In addition to providing NMFS monthly and annual reporting of marine mammal observations and other parameters described above, lessees will provide NMFS AKR, within 90 days of project completion, a report of all parameters listed in the monthly and annual report requirements above, noting also all operational shutdowns or delays necessitated due to the proximity of marine mammals. NMFS AKR will provide comments within 30 days after receiving this report, and the lessees must address the comments and submit revisions within 30 days after receiving NMFS comments. If no comments are received from the NMFS within 30 days, the final report is considered as final.

**10. Summary of Agency Contact Information**

| Reason for Contact | Contact Information |
|---|---|
| NMFS Alaska Regional Office (AKR) - ESA Consultation Questions, Reports & Data Submittal | Greg Balogh: greg.balogh@noaa.gov, 907-271-3023<br>Jill Prewitt: jill.prewitt@noaa.gov |
| Stranded, Injured, or Dead Marine Mammal (not related to project activities ) | Stranding Hotline (24/7 coverage) 877-925-7773 |
| Oil Spill Response | U.S. Coast Guard 17th District Command Center: 907-463-2000<br>Sadie Wright: 907-586-7630, sadie.wright@noaa.gov |
| Note: In the event that this contact information becomes obsolete please call NMFS Anchorage Main Office 907-271-5006 | |

## 2.2 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). For this reason, the action area is typically larger than the project area and extends out to a point where no measurable effects from the proposed action occur.

The Coastal Plain of ANWR was previously referred to as the 1002 Area. It includes all federal lands and waters comprising the approximately 1.6 million acres of the Coastal Plain at the northernmost part of the 19.3 million acre ANWR (Figure 1). It excludes a northern coastal portion of Air Force-administered lands near Kaktovik. Lands excluded from the definition of the Coastal Plain in Public Law 115-97, Native conveyed lands, and Native selected lands are also excluded.

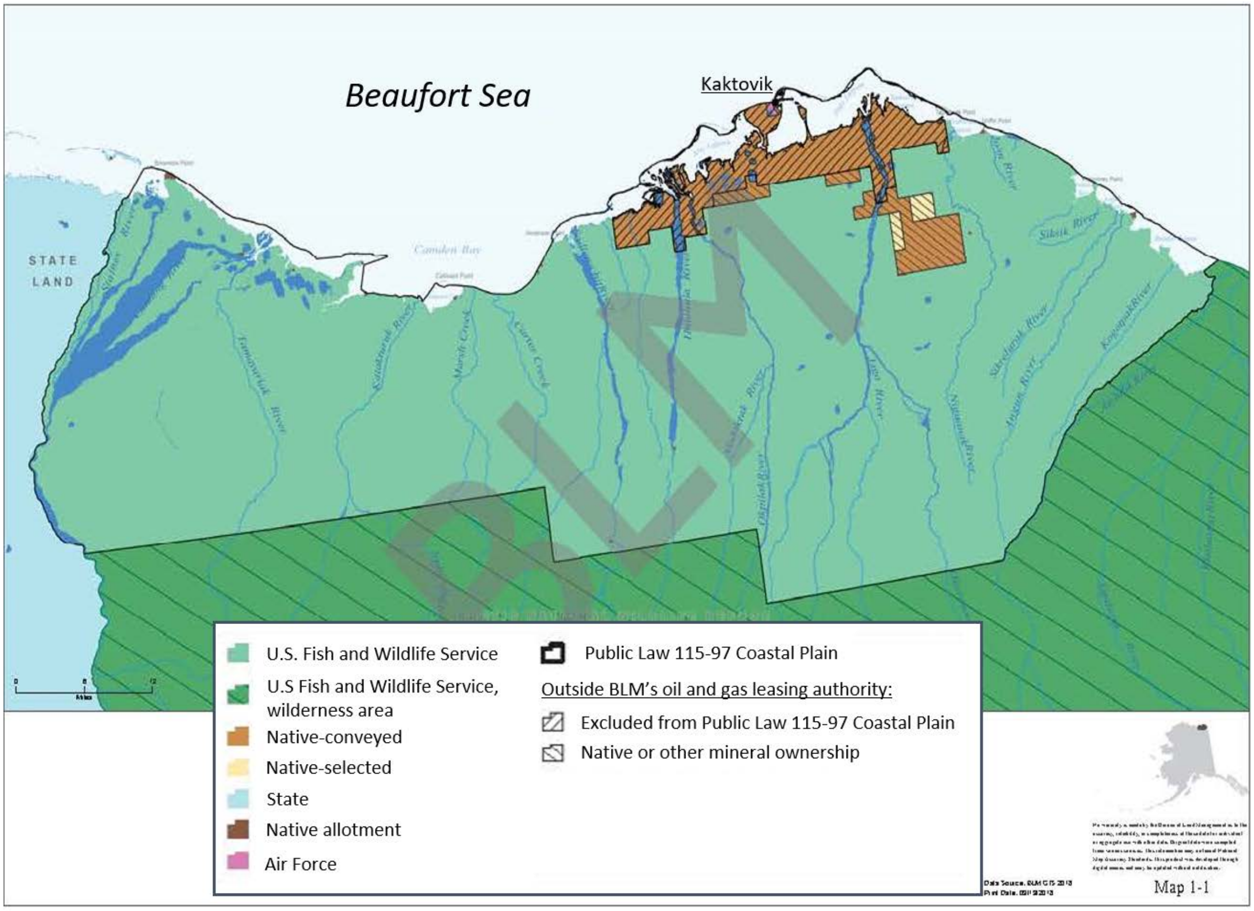


**Figure 1. Coastal Plain of the Arctic National Wildlife Refuge.**

For purposes of this consultation, NMFS defines the action area as:

- The Coastal Plain where oil and gas activities directly or indirectly could affect listed marine mammals, including the entire coastline of the Coastal Plain and adjacent marine waters extending into the Beaufort Sea to the ten foot bathymetry line (in which vibroseis surveys may occur),
- The 1600 nautical mile marine vessel transit route from Dutch Harbor to the barge landing site near Kaktovik (Figure 2).

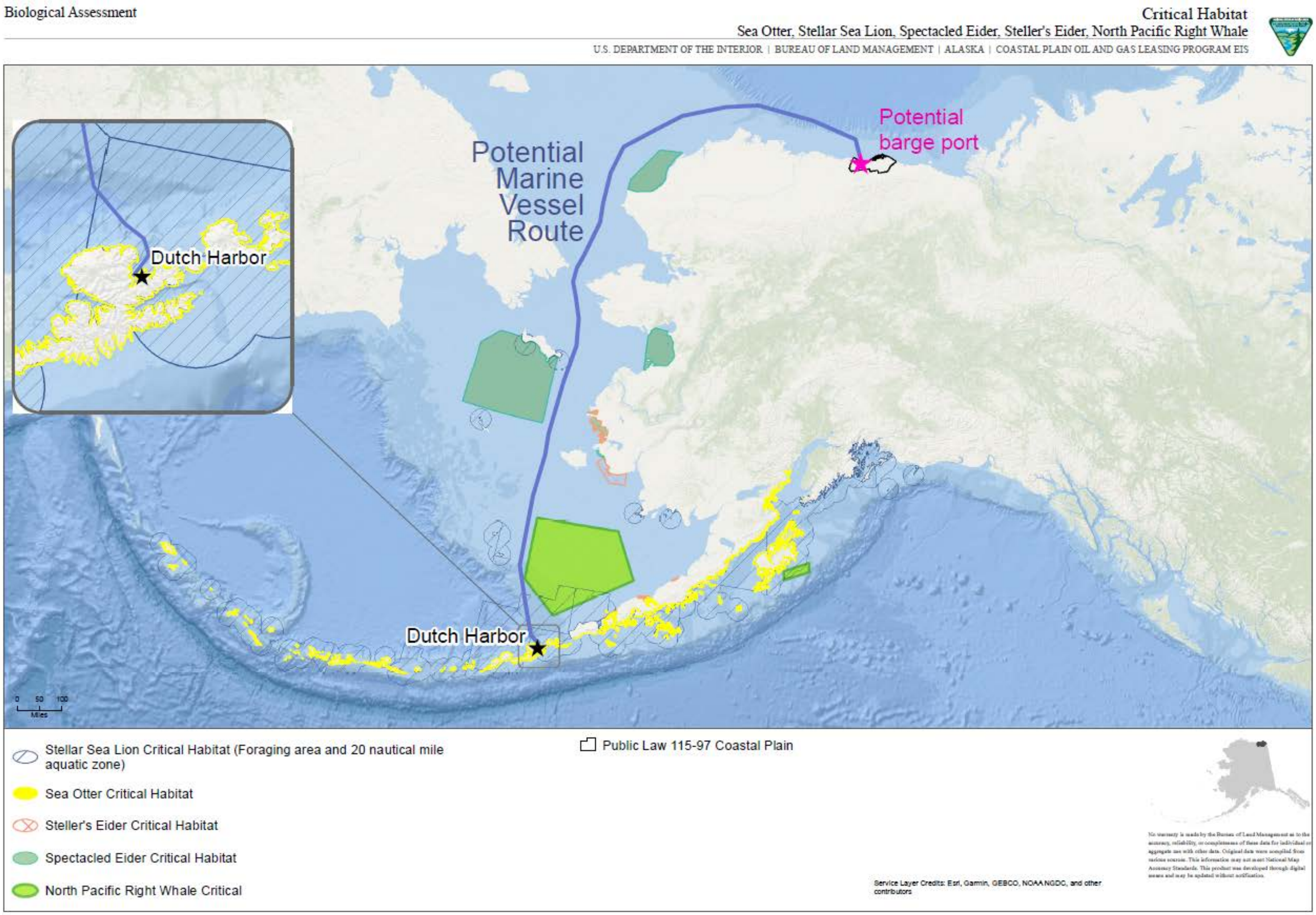


**Figure 2. Marine Transit Route (MTR) from Dutch Harbor to the proposed Coastal Plain barge landing site.**

# 3. APPROACH TO THE ASSESSMENT

Section 7(a)(2) of the ESA requires Federal agencies, in consultation with NMFS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. The jeopardy analysis considers both survival and recovery of the species. The adverse modification analysis considers the impacts to the conservation value of the designated critical habitat.

“To jeopardize the continued existence of a listed species” means to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). As NMFS explained when it promulgated this definition, NMFS considers the likely impacts to a species’ survival as well as likely impacts to its recovery. Further, it is possible that in certain, exceptional circumstances, injury to recovery alone may result in a jeopardy biological opinion (51 FR 19926, 19934; June 3, 1986).

Under NMFS’s regulations, the destruction or adverse modification of critical habitat “means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features” (50 CFR 402.02).

The designations of critical habitat for Steller sea lions and North Pacific right whales use the term primary constituent element (PCE) or essential features. The recent critical habitat regulations (81 FR 7414; February 11, 2016) replace this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a “destruction or adverse modification” analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether the proposed action described in Section 2.1 is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify those aspects (or stressors) of the proposed action that are likely to have direct or indirect effects on listed species or critical habitat. As part of this step, we identify the action areas (Action Area) – the spatial and temporal extent of these direct and indirect effects.
- Identify the rangewide status of the species and critical habitat likely to be adversely affected by the proposed action. Section 4 describes the current status of each listed species and its critical habitat relative to the conditions needed for recovery. We determine the rangewide status of critical habitat by examining the condition of its PBFs - which were identified when the critical habitat was designated.
- Describe the environmental baseline in Section 5 including: past and present impacts of Federal, state, or private actions and other human activities *in the action area*; anticipated impacts of proposed Federal projects that have already undergone formal or early section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process.

- Analyze the effects of the proposed actions. Identify the listed species that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (these represent our *exposure analyses*). In this step of our analyses, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to stressors and the populations or subpopulations those individuals represent. NMFS also evaluates the proposed action's effects on critical habitat features. The effects of the action are described in Section 6 of this opinion with the exposure analysis described in Section 6.2 of this opinion.
- Once we identify which listed species are likely to be exposed to an action's effects and the nature of that exposure, we examine the scientific and commercial data available to determine whether and how those listed species are likely to respond given their exposure (these represent our *response analyses*). Response analysis is considered in Section 6.3 of this opinion.
- Describe any cumulative effects in Section 7. Cumulative effects, as defined in NMFS's implementing regulations (50 CFR 402.02), are the effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area. Future Federal actions that are unrelated to the proposed action are not considered because they require separate section 7 consultation.
- Integrate and synthesize the above factors to assess the risk that the proposed action poses to species and critical habitat. In this step, NMFS adds the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to assess whether the action could reasonably be expected to: (1) appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species and critical habitat (Section 4). Integration and synthesis with risk analyses occurs in Section 8 of this opinion.
- Reach jeopardy and adverse modification conclusions. Conclusions regarding jeopardy and the destruction or adverse modification of critical habitat are presented in Section 9. These conclusions flow from the logic and rationale presented in the Integration and Synthesis Section 8.
- If necessary, define a reasonable and prudent alternative to the proposed action. If, in completing the last step in the analysis, NMFS determines that the action under consultation is likely to jeopardize the continued existence of listed species or destroy or adversely modify designated critical habitat, NMFS must identify a reasonable and prudent alternative (RPA) to the action.

## 4. RANGEWIDE STATUS OF THE SPECIES AND CRITICAL HABITAT

Ten species of marine mammals listed under the ESA under NMFS's jurisdiction may occur in the action area. The action area also includes designated critical habitat for two species. This opinion considers the effects of the proposed action on these species and designated critical habitats (Table 2).

**Table 2. Listing status and critical habitat designation for marine mammals considered in this opinion.**

| Species | Status | Listing | Critical Habitat |
|---|---|---|---|
| Bowhead Whale (*Balanea mysticetus*) | Endangered | NMFS 1970, 35 FR 18319 | Not designated |
| Blue whale (*Balaenoptera musculus*) | Endangered | NMFS 1970, 35 FR 18319 | Not designated |
| Fin Whale (*Balaneoptera physalus*) | Endangered | NMFS 1970, 35 FR 18319 | Not designated |
| Humpback Whale, Western North Pacific DPS (*Megaptera novaeangliae*) | Endangered | NMFS 2016, 81 FR 62260 | Not designated |
| Humpback Whale, Mexico DPS (*Megaptera novaeangliae*) | Threatened | NMFS 2016, 81 FR 62260 | Not designated |
| North Pacific Right Whale (*Eubalaena japonica*) | Endangered | NMFS 2008, 73 FR 12024 | NMFS 2008, 73 FR 19000 |
| Sperm Whale (*Physeter macrocephalus*) | Endangered | NMFS 1970, 35 FR 18319 | Not designated |
| Ringed Seal, Arctic Subspecies (*Phoca hispida hispida*) | Threatened | NMFS 2012, 77 FR 76706 | Not designated |
| Bearded Seal, Beringia DPS (*Erignathus barbatus nauticus*) | Threatened | NMFS 2012, 77 FR 76740 | Not designated |
| Steller Sea Lion, Western DPS (*Eumetopias jubatus*) | Endangered | NMFS 1997, 62 FR 24345 | NMFS 1993, 58 FR 45269 |

### 4.1 Blue whale

Blue whales may occur along the marine transit route. The blue whale was listed as an endangered species under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319) after being depleted by whaling, and continued to be listed as endangered following passage of the ESA. A recovery plan was published in 1998 (NMFS 1998), but critical habitat has not been designated. Although blue whales have been divided into stocks for management purposes under the MMPA, distinct population segments have not been adopted under the ESA. The North Pacific population, comprised of the Central North Pacific and Eastern North Pacific stocks, occurs in Alaska.

The global population of blue whales is uncertain, but based on the above information, the global total for the species is plausibly in the range 10,000-25,000, corresponding to about 3-11% of the 1911 population size (IUCN 2017). The Central North Pacific stock is estimated at 81 individuals, and insufficient data exist to assess population trends (Carretta et al. 2017). The most recent MMPA stock assessment report estimated the abundance of the Eastern North Pacific stock at 1,647 individuals; the report further determined that the population trend is uncertain and there is little evidence to support that it is increasing (Carretta et al. 2017). Another recent report estimated that the Eastern North Pacific stock is at 97% of its carrying capacity at about 2,200 animals and that density dependent factors are a key reason for the observed lack of increase in population size (Monnahan et al. 2015).

Acoustical data suggests two populations of North Pacific blue whales found in the eastern and western north Pacific (Stafford et al. 2001, Stafford 2003, McDonald et al. 2006, Monnahan et al. 2015). The northeastern call predominates in the Gulf of Alaska, the U.S. West Coast, and the eastern tropical pacific, while the northeastern call predominates from the south of the Aleutian Islands to the Kamchatka Peninsula in Russia, overlapping in the Gulf of Alaska (Muto et al. 2017). Individuals from these populations may be present in the action area along the marine transit route.

Blue whales from the Eastern Pacific stock spend winters off Mexico, Central America, and as far as 8°S, and feed during summer off the U.S. West Coast and to a lesser extent in the Gulf of Alaska (Carretta et al. 2017). The Central North Pacific stock spend winters in lower latitudes in the western and central Pacific, including Hawaii, and feed in summer southwest of Kamchatka, south of the Aleutians, and in the Gulf of Alaska (Carretta et al. 2017).

Although the populations of blue whales were severely depleted by whaling, no evidence is available to suggest that this exploitation resulted in a major change in their distribution during modern times, except perhaps in the eastern North Atlantic and the western North Pacific (NMFS 1998). It is assumed that blue whale distribution is governed largely by food requirements (krill) and that populations are seasonally migratory. Poleward movements in spring allow the whales to take advantage of high zooplankton production in summer. Movement toward the subtropics in the fall allows blue whales to reduce their energy expenditure while fasting, avoid ice entrapment in some areas, and engage in reproductive activities in warmer waters of lower latitudes (NMFS 1998).

Blue whales are in the low frequency (LF) cetacean functional hearing group (Southall et al. 2007).

Additional information on blue whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/blue-whale
https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

### 4.2 Fin whale

Fin whales may occur along the marine transit route. NMFS listed the entire species of fin whale rangewide as endangered in 1970 (35 FR 18319) following large scale declines due to commercial whaling. Congress replaced the ESCA with the ESA in 1973, and fin whales continued to be listed throughout their range as endangered. A recovery plan was prepared in 2010 (NMFS 2010d). Critical habitat has not been designated for this species. Under the MMPA, NMFS manages three fin whale stocks in the North Pacific: (1) the Hawaii stock; (2) the California/Oregon/Washington stock, and (3) the Alaska stock (Carretta et al. 2017).

Prior to exploitation by commercial whalers, fin whales are thought to have numbered greater than 464,000 worldwide, and are now thought to number approximately 119,000 worldwide (Braham 1991). Although reliable and recent estimates of fin whale abundance are available for large portions of the North Atlantic Ocean, this is not the case for most of the North Pacific Ocean or for the Southern Hemisphere (NMFS 2010d). For the Hawaii stock, the best abundance estimate is 58 whales, and no data are available on the population trend for this stock (Carretta et al. 2017). The best estimate for the Northeast Pacific stock is 1,368 whales; the trend appears to be increasing since at least 2002 (Friday et al. 2013), but the true magnitude of that increase is uncertain (Carretta et al. 2017). The California/Oregon/Washington stock is estimated at 9,029 whales with evidence for an increasing trend (Carretta et al. 2017).

Fin whales are distributed widely in every ocean except the Arctic Ocean (though occasional sightings have been reported in recent years). In the North Pacific Ocean, fin whales occur in summer foraging areas in the Chukchi Sea, the Sea of Okhotsk, around the Aleutian Islands, and the Gulf of Alaska (Figure 3); in the eastern Pacific, they occur south to California; in the western Pacific, they occur south to Japan. Coastal and pelagic catch data from the first half of the twentieth century indicate that fin whales were not uncommon near Unalaska Bay and around Unalaska Island (Nishiwaki 1966, Reeves et al. 1985); however, fin whales have been documented infrequently around Unalaska Island since whaling ended (Stewart et al. 1987, Zerbini et al. 2006). Fin whales may be present in the action area along the marine transit route.

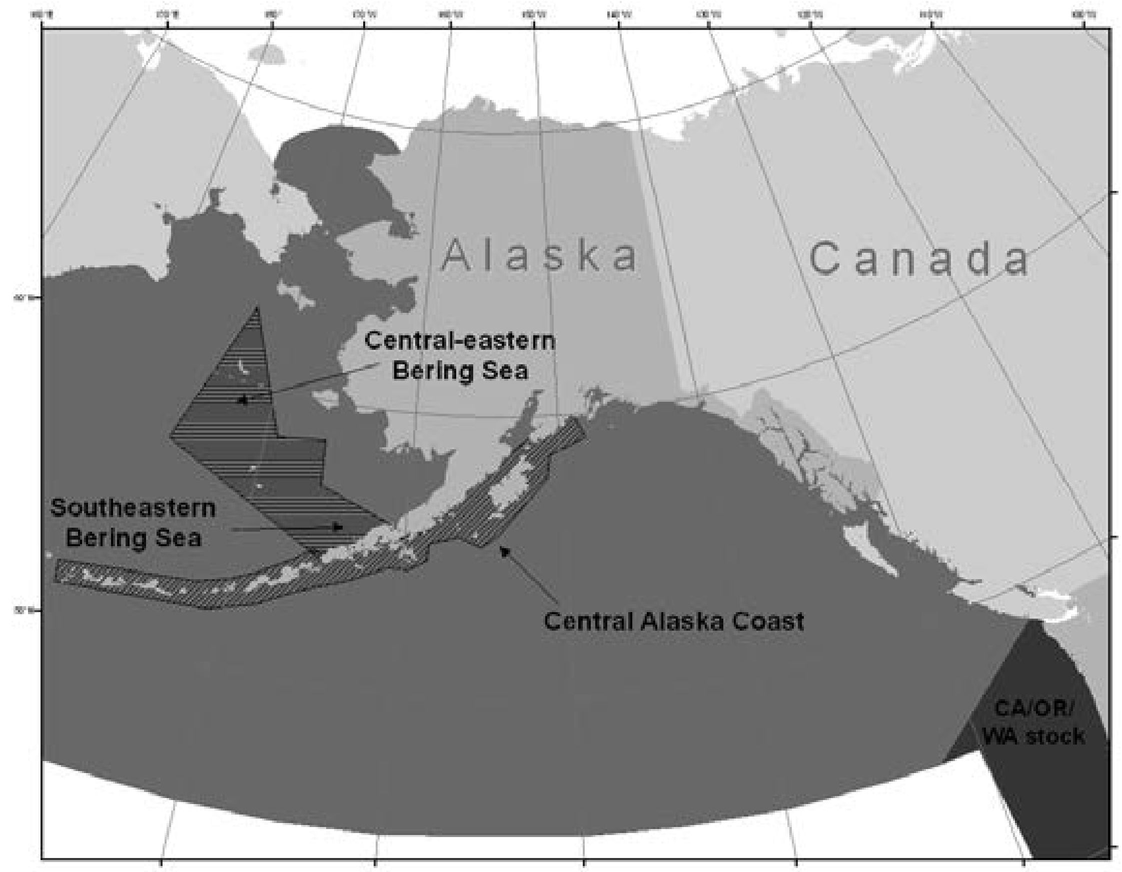


**Figure 3. Approximate distribution of fin whales in the eastern North Pacific Ocean (shaded area) (Muto et al. 2017). Striped areas indicate where vessel surveys occurred in 1999-2000 (Moore et al. 2002) and 2001-2003 (Zerbini et al. 2006).**

In the North Pacific, fin whales' preferred prey is euphausiids (mainly *Euphausia pacifica*, *Thysanoessa longipes*, *T. spinifera*, and *T. inermis*) and large copepods (mainly *Calanus cristatus*), followed by schooling fish such as herring, walleye pollock, and capelin (Nemoto 1970).

Fin whales produce a variety of low-frequency sounds in the 10 Hz to 0.2 kHz range (Watkins 1981, Watkins et al. 1987, Edds 1988, Thompson et al. 1992). While there is no direct data on hearing in low-frequency cetaceans, the applied frequency range is anticipated to be between 7 Hz and 35 kHz (NMFS 2016c). Synthetic audiograms produced by applying models to X-ray computed tomography scans of a fin whale calf skull indicate the range of best hearing for fin whale calves from approximately 20 Hz to 10 kHz, with maximum sensitivities between 1 to 2 kHz (Cranford and Krysl 2015).

More information on fin whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/fin-whale
https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

## 4.3 Humpback Whale

Western North Pacific (WNP) DPS and Mexico DPS humpback whales may occur along the marine transit route. The humpback whale was listed as endangered under the ESCA on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. In 2016, NMFS conducted a global status review and changed the status of humpback whales under the ESA. Three DPSs are present in Alaska waters: the WNP DPS (which includes a small proportion of humpback whales found in the Aleutian Islands, Bering Sea, and Gulf of Alaska) is listed as endangered; the Mexico DPS (which includes a small proportion of humpback whales found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska) is listed as threatened; and the Hawaii DPS (which includes most humpback whales found in the Aleutian Islands, Bering Sea, Gulf of Alaska, and Southeast Alaska) is not listed (81 FR 62260; September 8, 2016). Critical habitat has not been designated for the Western North Pacific or Mexico DPSs.

Whales from these three DPSs overlap on feeding grounds off Alaska. All waters off the coast of Alaska may contain ESA-listed humpbacks. Humpback whales may be present in the action area along the marine transit route to the Coastal Plain.

The WNP DPS is endangered, and is comprised of approximately 1,107 (CV=0.3) animals (Muto et al. 2017). The population trend for the WNP DPS is unknown. Humpback whales in the WNP DPS remain rare in some parts of their former range, such as the coastal waters of Korea, and have shown little signs of recovery in those locations.

The Mexico DPS is threatened, and is comprised of approximately 3,264 (CV=0.06) animals (Wade et al. 2016) with an unknown population trend, though unlikely to be in decline (81 FR 62260, 62305; September 8, 2016).

The Hawaii DPS is not listed under the ESA, and is estimated to be comprised of 10,103 (CV=0.3) animals (Muto et al. 2017). The population trend for the Hawaii DPS is estimated to be increasing at a rate of between 5.5 and 6.0 percent (Calambokidis et al. 2008).

Humpback whales have been observed throughout much of the shelf waters (waters over the continental shelves) of the Bering Sea, but densities of humpbacks appear relatively low in the northern shelf area, with relatively few sightings north of St. Lawrence Island (Friday et al. 2013; Moore et al. 2002). Humpback whales are consistently concentrated in coastal waters north of Unimak Pass (Friday et al. 2013). In the Aleutian Islands, there are high densities of humpback whales in the eastern Aleutians, but the densities decline in the western Aleutian Islands (Zerbini et al. 2006).

Humpback whales have also been observed during the summer in the Chukchi and Beaufort Seas (Allen and Angliss 2015). In August 2007, a mother-calf pair was sighted from a barge approximately 87 km (54.1 mi) east of Barrow in the Beaufort Sea (Hashagen et al. 2009). Additionally, Ireland et al. (2008) reported three humpback sightings in 2007 and one in 2008 during surveys of the eastern Chukchi Sea.

During vessel-based surveys in the Chukchi Sea, Hartin et al. (2013) reported four humpback whales in 2007, two in 2008, and one in 2010. Five humpback sightings (11 individuals) occurred during the CSESP vessel-based surveys in 2009 and 2010 (Aerts et al. 2012), and a single humpback was observed several kilometers west of Barrow during the 2012 Chukchi Sea Environmental Studies Program vessel-based survey (Aerts et al. 2013).

The Aerial Surveys of Arctic Marine Mammals (ASAMM) reported four humpback whale sightings near the coast between Icy Cape and Pt. Barrow in July and August of 2012, as well as 24 individual humpback whales on September 11, 2012, south and east of Pt. Hope (Clarke et al. 2013). Prior to 2012 only a single humpback had been sighted during the Chukchi Offshore Monitoring in Drilling Area Survey (Clarke et al. 2011).

Humpback whales have been seen and heard with some regularity in recent years (2009-2012) in the southern Chukchi Sea, often feeding and in very close association with feeding gray whales. Sightings have occurred mostly in September, but effort in the southern Chukchi has not been consistent and it is possible that humpback whales are present earlier than September (Clarke et al. 2011; Crance et al. 2011; Hashagen et al. 2009). Additional sightings of four humpback whales occurred in 2009 south of Point Hope, while transiting to Nome (Brueggeman 2010).

Humpback whales tend to feed on summer grounds and not on winter grounds. However, some opportunistic winter feeding has been observed at low latitudes (Perry et al. 1999). Humpback whales engulf large volumes of water and then filter small crustaceans and fish through their fringed baleen plates. Humpback whales are relatively generalized in their feeding compared to some other baleen whales. In the Northern Hemisphere, known prey includes: euphausiids (krill); copepods; juvenile salmonids; Arctic cod; walleye pollock; pteropods; and cephalopods (Johnson and Wolman 1984; Perry et al. 1999). Foraging is confined primarily to higher latitudes (Stimpert et al. 2007).

Humpback whales produce a variety of vocalizations ranging from 20 Hz to 10 kHz (Winn et al. 1970, Tyack and Whitehead 1983, Payne and Payne 1985, Silber 1986, Thompson et al. 1986, Richardson et al. 1995, Au 2000, Frazer and Mercado III 2000, Erbe 2002a, Au et al. 2006, Vu et al. 2012). NMFS categorizes humpback whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2016c).

Additional information on humpback whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/humpback-whale
https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

## 4.4 North Pacific Right whale

North Pacific right whales may occur along the marine transit route. The Northern right whale was listed as an endangered species under the ESCA on June 2, 1970 (35 FR 8491), and continued to be listed as endangered following passage of the ESA. NMFS later divided the listing into two separate endangered species: North Pacific right whales and North Atlantic right whales (73 FR 120424; March 6, 2008). Only the North Pacific right whale occurs in Alaska. Critical habitat has been designated for the North Pacific right whale (Figure 4) (73 FR 19000; April 8, 2008). North Pacific right whales may be present in the action area along the marine transit route.

The North Pacific right whale is comprised of two populations, the eastern and the western. The eastern population of North Pacific right whale occurs in the Bering Sea and Gulf of Alaska, but may range as far south as Baja California, Mexico in the eastern Pacific, and Hawaii in the central Pacific (Allen and Angliss 2014). This population was severely depleted by legal and illegal commercial whaling up until 1999 (Brownell et al. 2001; Wade et al. 2011a).

The eastern North Pacific right whale is arguably the most endangered stock of large whale in the world with approximately 31 individuals (Muto et al. 2017). The western population is also small and at risk of extinction; however, no reliable published estimate of abundance exists. Survey data suggest it is much larger than the eastern population, numbering several hundred or more animals (Brownell et al. 2001). No estimate of trend in abundance is currently available (Muto et al. 2017).

The North Pacific right whale is distributed from Baja California to the Bering Sea with the highest concentrations in the Bering Sea, Gulf of Alaska, Okhotsk Sea, Kuril Islands, and Kamchatka area. They are primarily found in coastal or shelf waters but sometimes travel into deeper waters. In the spring through the fall their distribution is dictated by the distribution of their prey. In the winter, pregnant females move to shallow waters in low latitudes to calve; the winter habitat of the rest of the population is unknown.

Whaling data indicate that North Pacific right whales once ranged across the entire North Pacific north of 35°N and occasionally as far south as 20°N (Scarff 1986; Scarff 2001). Prior to near extirpation due to commercial whaling, right whale concentrations were found in the Gulf of Alaska, eastern Aleutian Islands, south-central Bering Sea, Sea of Okhotsk, and Sea of Japan (Braham and Rice 1984). Since 1962, most sightings of North Pacific right whales have been in the Bering Sea and adjacent areas of the Aleutian Islands, with additional sightings as far south as central Baja California, as far east as Yakutat, Alaska, and Vancouver Island in the eastern North Pacific, as far south as Hawaii in the central North Pacific, and as far north as the subarctic waters of the Bering Sea and Sea of Okhotsk (Muto et al. 2017). Most recent North Pacific right whale sightings have been in the southeastern Bering Sea, with a few in the Gulf of Alaska, near Kodiak (Shelden et al. 2005; Wade et al. 2011a; Wade et al. 2011b).

It was thought this population migrated from high-latitude feeding grounds in summer to more temperate waters during the winter, possibly well offshore (Clapham et al. 2004; Scarff 1986). However, passive acoustic monitoring from 2011 to 2014 suggests that some North Pacific right whales may occur in the northern Bering Sea during winter months (Muto et al. 2017). An individual was visually identified north of St. Lawrence Island (northern Bering Sea) in November 2012 (Muto et al. 2017).

In August 2017, two right whales were detected in Bristol Bay, about 55 miles east of their designated critical habitat. Aerial and vessel surveys for right whales have occurred in a portion of the southeastern Bering Sea where right whales have been observed most summers since 1996 (Rone et al. 2012). Acoustic recorders in the southeastern Bering Sea have detected North Pacific right whales from May through January, with peak call detections in September and a sharp drop-off in detections by mid-November (Mellinger et al. 2004b; Munger et al. 2008; Stafford and Mellinger 2009; Stafford et al. 2010). The probability of acoustically detecting right whales in the Bering Sea is strongly influenced by the abundance of the copepod *Calanus marshallae*, a primary prey species for right whales on the Bering Sea shelf (Baumgartner et al. 2013).

Since 1980, eastern North Pacific right whales have been observed singly or in small groups, sometimes in association with dense zooplankton layers, south of Kodiak, in on-shelf and mid-slope waters in the Gulf of Alaska, near Unimak Pass in the Aleutian Islands, and on the mid-shelf of the Bering Sea, suggesting that this is important habitat for this population (Shelden et al. 2005; Wade et al. 2011a; Zerbini et al. 2010).

Right whales have been consistently detected in the southeastern Bering Sea within and near their designated critical habitat during spring and summer feeding seasons (Goddard and Rugh. 1998, Moore 2000, Moore et al. 2002, Zerbini et al. 2009, Rone et al. 2010, Rone et al. 2012). Of the 184 right whale sightings reported north of the Aleutian Islands from 1973 to 2006, 182 occurred within the area designated as critical habitat in the Bering Sea. Sightings have since occurred in the Bering Sea and Gulf of Alaska, as well as acoustic monitoring of North Pacific right whale calling. Aerial surveys in 2008 documented 13 North Pacific right whales (NMFS 2017). In 2017, 17 right whales were found in the southeastern Bering Sea (Muto et al. 2019). Lone animals have been observed off Kodiak Island during NOAA surveys in 2004 through 2006. A single right whale was reported near Kodiak in 2010. A single right whale was also spotted in 2011 near Kodiak. In 2017, a potentially new individual was observed near Kodiak (Muto et al. 2019). During the 2018 International Whaling Commission POWER cruise, two North Pacific right whale sightings occurred in their designated critical habitat (IWC 2019).

Analysis of the data from bottom-mounted acoustic recorders deployed in October 2000, January 2006, May 2006, and April 2007 indicates that right whales remain in the southeastern Bering Sea from May through December with peak call detection in September (Munger et al. 2008, Stafford and Mellinger 2009). Additional recorders deployed from 2007 to 2013 indicate the presence of right whales in the southeastern Bering Sea almost year-round, with a peak in August and a sharp decline in detections in early January (Crance et al. 2017, Wright et al. 2018).

A study of right whale ear anatomy indicates a total possible hearing rage of 10 Hz to 22 kHz (Parks et al. 2007). NMFS categorizes right whales in the low-frequency cetacean functional hearing group, with an applied frequency range between 7 Hz and 35 kHz (NMFS 2016c).

More information on biology and habitat of the North Pacific right whale is available at:

https://alaskafisheries.noaa.gov/pr/npr-whale
http://www.adfg.alaska.gov/index.cfm?adfg=rightwhale.main
https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

## 4.5 North Pacific Right Whale Critical Habitat

Critical habitat for the North Pacific right whale was designated on April 8, 2008 (Figure 4, 73 FR 19000). The PBFs deemed necessary for the conservation of North Pacific right whales include the presence of specific copepods (*Calanus marshallae*, *Neocalanus cristatus*, and *N.*

*plumchris*), and euphausiids (*Thysanoessa Raschii*) that act as primary prey items for the species, and physical and oceanographic forcing that promote high productivity and aggregation of large copepod patches. Two areas in Alaska were included in the designation, one in the Bering Sea and one in the Gulf of Alaska (Figure 4), comprising a total of approximately 95,200 square kilometers (36,750 square miles) of marine habitat. From 1973 (when the species was listed under the ESA) to 2006 (when critical habitat was first designated for the northern right whale, before the same areas were designated specifically for the North Pacific right whale), 182 of 184 sightings of the North Pacific right whale north of the Aleutians occurred within the area in the Bering Sea designated as critical habitat, and 5 of 14 sightings in the Gulf of Alaska occurred within the Gulf of Alaska critical habitat (Figure 4). During the 2018 International Whaling Commission POWER cruise, two North Pacific right whale sightings occurred in their designated critical habitat (IWC 2019).

The marine transit route is adjacent to the Bering Sea critical habitat area (see Figure 2 and Figure 4).

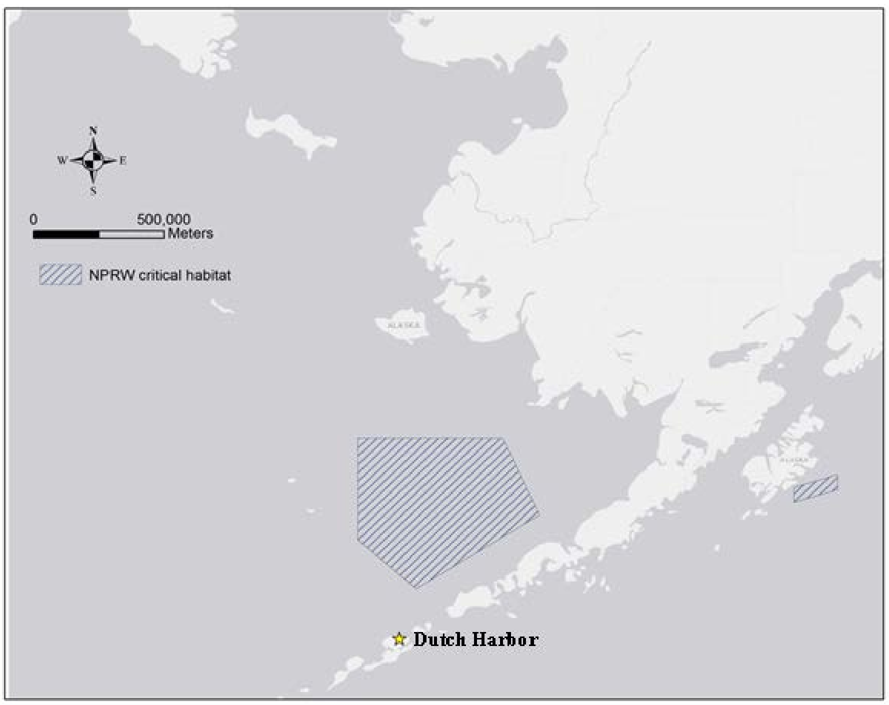


**Figure 4. North Pacific right whale critical habitat in the Bering Sea and Gulf of Alaska**

## 4.6 Sperm Whale

Sperm whales may occur along the marine transit route. The sperm whale was listed as an endangered species under the ESCA on December 2, 1970 (35 FR 18319) following widespread depletions due to commercial whaling, and continued to be listed as endangered following passage of the ESA. A recovery plan was prepared in 2010 (NMFS 2010c). Critical habitat has not been designated for the sperm whale. Sperm whales may be present in the action area along the marine transit route.

The sperm whale is one of the most widely distributed marine mammals (Muto et al. 2017; Figure 10). Currently, the population structure of sperm whales has not been adequately defined (NMFS 2010c). For management purposes under the MMPA, three stocks of sperm whale are currently recognized in U.S. waters of the Pacific Ocean: (1) Alaska (also termed North Pacific stock), (2) California/Washington/Oregon, and (3) Hawaii (Muto et al. 2017). The North Pacific stock is the only stock occurring in Alaska waters (Muto et al. 2017).

Whitehead (2002) estimated the global abundance of sperm whale at 1,110,000 animals prior to commercial whaling. Rice (1989) estimated the North Pacific stock at 1,260,000 animals prior to exploitation (which is larger than Whitehead's estimate for the global population), and estimated that by the 1970s, the North Pacific stock had been reduced to 930,000 whales. Although the number of sperm whales occurring in Alaska waters is unknown, 102,112 sperm whales are estimated to occur in the western North Pacific region (Kato and Miyashita 1998). There is no current reliable estimate of the global abundance of sperm whale, or of the North Pacific stock in Alaska (Muto et al. 2019). Therefore, a population trend for sperm whales in the North Pacific stock is also not available (Muto et al. 2019).

Sperm whales inhabit all oceans worldwide and can be observed along the pack ice edge in both hemispheres. They are most commonly found in deep ocean waters (typically deeper than 900 feet) between latitudes 60º N and 60º S. In Alaska, sperm whales commonly occur in the Gulf of Alaska, Bering Sea, around the Aleutian Islands, and some parts of Southeast Alaska during the summer months (Muto et al. 2017). Sperm whales occur year around in the Gulf of Alaska, but appear to be more common during the summer months than winter months (Mellinger et al. 2004a). Sperm whales are thought to migrate to higher latitude foraging grounds in the summer and lower latitudes in the winter (Muto et al. 2017). The northernmost boundary for sperm whales in the North Pacific extends from Cape Navarin, Russia (latitude 62º N) to the Pribilof Islands, Alaska (Allen and Angliss 2014; Omura 1955).

Sperm whales feed primarily on medium-sized to large-sized squids, and also eat other prey items including cephalopods (such as octopi) and large demersal mesopelagic sharks, skates, and fishes (Allen and Angliss 2014; Rice 1989).

Sperm whales produce a variety of vocalizations ranging from 0.1 to 20 kHz (Weilgart and Whitehead 1993, Goold and Jones 1995, Møhl et al. 2003, Weir et al. 2007). Our understanding of sperm whale hearing stems largely from the sounds they produce. Sperm whales are odontocetes (tooth whales) and are considered mid-frequency cetaceans with an applied frequency range of 150 Hz to 160 kHz (NMFS 2016c). The only direct measurement of hearing was from a young stranded individual from which auditory evoked potentials were recorded and indicated a hearing range of 2.5 to 60 kHz (Carder and Ridgway 1990).

More information on sperm whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/sperm-whale
https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

## 4.7 Western DPS Steller sea lions

Western DPS Steller sea lions may occur along the marine transit route. The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions into two distinct population segments (DPS) based on genetic studies and other information (62 FR 24345); at that time the eastern DPS was listed as threatened and the western DPS was listed as endangered. On November 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66139). Critical habitat has been designated for Steller sea lions (Figure 5) (50 CFR 226.202). Steller sea lions may be present in the action area along the marine transit route.

Numbers of Steller sea lions declined dramatically throughout much of the species' range, beginning in the mid- to late 1970s (Braham et al. 1980, Merrick et al. 1987, NMFS 1992, NMFS 1995). For two decades prior to the decline, the estimated total population was 250,000 to 300,000 animals (Kenyon and Rice 1961, Loughlin et al. 1984). The population estimate declined by 50-60 percent to about 116,000 animals by 1989 (NMFS 1992), and by an additional 15 percent by 1994, with the entire decline occurring in the range of the western DPS.

The most recent comprehensive aerial photographic and land-based surveys of western Steller sea lions in Alaska estimated a total Alaska population (both pups and non-pups) of 53,303 (Muto et al. 2019). Although Steller sea lion abundance continues to decline in the western Aleutians, numbers are thought to be increasing in the eastern part of the western DPS range. .

Steller sea lions range throughout the North Pacific Ocean from Japan, east to Alaska, and south to central California (Loughlin et al. 1984). They range north to the Bering Strait, with significant numbers at haul-outs on St. Lawrence Island in the spring and fall (Kenyon and Rice 1961). Breeding range extends along the northern edge of the North Pacific Ocean from the Kuril Islands, Japan, through the Aleutian Islands and Southeast Alaska, and south to California (Loughlin et al. 1984).

Land sites used by Steller sea lions are referred to as rookeries and haulouts. Rookeries are used by adult sea lions for pupping, nursing, and mating during the reproductive season (generally from late May to early July). Haulouts are used by all age classes of both genders but are generally not where sea lions reproduce. Sea lions move onshore and offshore for feeding excursions. At the end of the reproductive season, some females may move with their pups to other haulout sites, and males may migrate to distant foraging locations (Pitcher and Calkins 1981; Spalding 1964). Sea lions may make semi-permanent or permanent one-way movements from one site to another (Burkanov and Loughlin 2005; Chumbley et al. 1997). Round trip migrations of greater than 6,500 km by individual Steller sea lions have been documented (Jemison et al. 2013).

Most adult Steller sea lions occupy rookeries during the pupping and breeding season, which extends from late May to early July (Pitcher and Calkins 1981, Gisiner 1985), and exhibit high site fidelity (Sandegren 1970). During the breeding season some juveniles and non-breeding adults occur at or near the rookeries, but most are on haulouts (Rice 1998; Ban 2005; Call and Loughlin 2005).

The foraging strategy of Steller sea lions is strongly influenced by seasonality of sea lion reproductive activities on rookeries and the ephemeral nature of many prey species. Steller sea lions are generalist predators that eat a variety of fishes and cephalopods (Calkins and Goodwin 1988; NMFS 2008; Pitcher 1981), and occasionally other marine mammals and birds (NMFS 2008; Pitcher and Fay 1982). During summer Steller sea lions feed mostly over the continental shelf and shelf edge. Females attending pups forage within 20 nm of breeding rookeries (Merrick and Loughlin 1997), which is the basis for designated critical habitat around rookeries and major haulout sites.

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. NMFS categorizes Steller sea lions in the otariid pinniped functional hearing group, with an applied frequency range between 60 Hz and 39 kHz in water (NMFS 2016c).

More information on Steller sea lion biology and habitat (including critical habitat) is available at:

http://alaskafisheries.noaa.gov/pr/steller-sea-lions
https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

### 4.8 Steller Sea Lion Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). In Alaska, designated critical habitat includes the following areas as described at 50 CFR §226.202.

1. Terrestrial zones that extend 3,000 feet (0.9 km) landward from each major haulout and major rookery.
2. Air zones that extend 3,000 feet (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska.
3. Aquatic zones that extend 3,000 feet (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144° W longitude.
4. Aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144° W longitude.
5. Three special aquatic foraging areas: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area, as specified at 50 CFR §226.202(c).

One portion of the action area (the marine transit route) overlaps with a very small portion of designated Steller sea lion critical habitat. The nearest major rookeries and haulouts to the action area are located on Akutan Island, Old Man Rocks, and Cape Sedanka approximately 15-18 nm away from the action area along the marine transit route. Barging activities will also traverse through the Bogoslof critical habitat foraging area (Figure 2). Mitigation measures to reduce impact on Steller sea lion critical habitat are discussed above and include that vessel operators will not approach within 3 nm (5.5 km) of any major Steller sea lion rookeries or haulouts listed in regulation (50 CFR 224.103(d)(1)(iii) & 50 CFR 226.202), except in emergency situations (refer to Mitigation Measures Section).

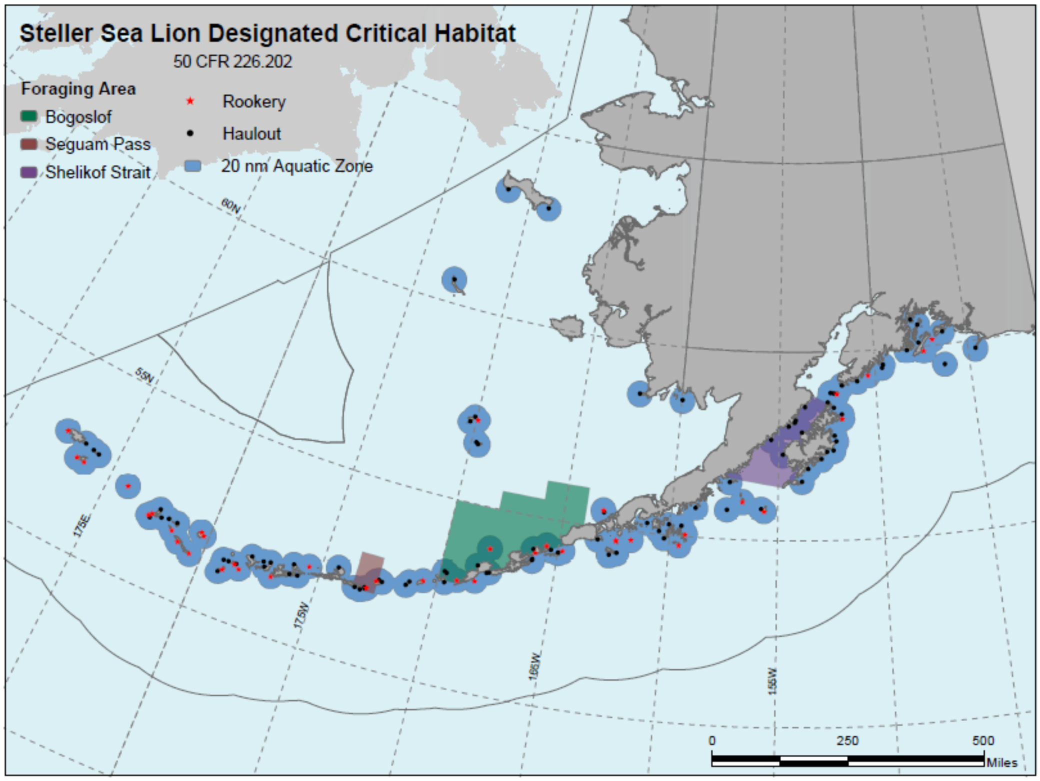


**Figure 5. Designated critical habitat for the Steller sea lion (50 CFR 226.202)**

## 4.9 Bowhead Whale

Bowhead whales may occur along the marine transit route and adjacent to the Coastal Plain. The bowhead whale was listed as endangered under the ESCA on December 2, 1970 (35 FR 18319), and continued to be listed as endangered following passage of the ESA. Bowhead whales in Alaskan waters comprise the Western Arctic stock. Critical habitat has not been designated for the bowhead whale.

Western Arctic bowhead whales are distributed in seasonally ice-covered waters of the Arctic and near-Arctic, generally north of 60°N and south of 75°N in the western Arctic Basin (Braham 1984, Moore and Reeves 1993). During winter and spring, bowhead whales are closely associated with pack ice or in polynyas (large, semi-stable open areas of water within the ice), and move north as the sea ice breaks up and recedes during the spring. During summer, most of the population is in relatively ice-free waters in the southeastern Beaufort Sea; however, some whales move back and forth between the Alaskan and Canadian Beaufort Sea during the summer feeding season (Quakenbush et al. 2010).

The majority of the Western Arctic stock migrates annually from wintering areas (December to March) in the northern Bering Sea, through the Chukchi Sea in the spring (April through May), to the eastern Beaufort Sea where they spend much of the summer feeding (June through early to mid-October) before returning again to the Bering Sea in the fall (September through December) to overwinter (Figure 6) (Muto et al. 2017).

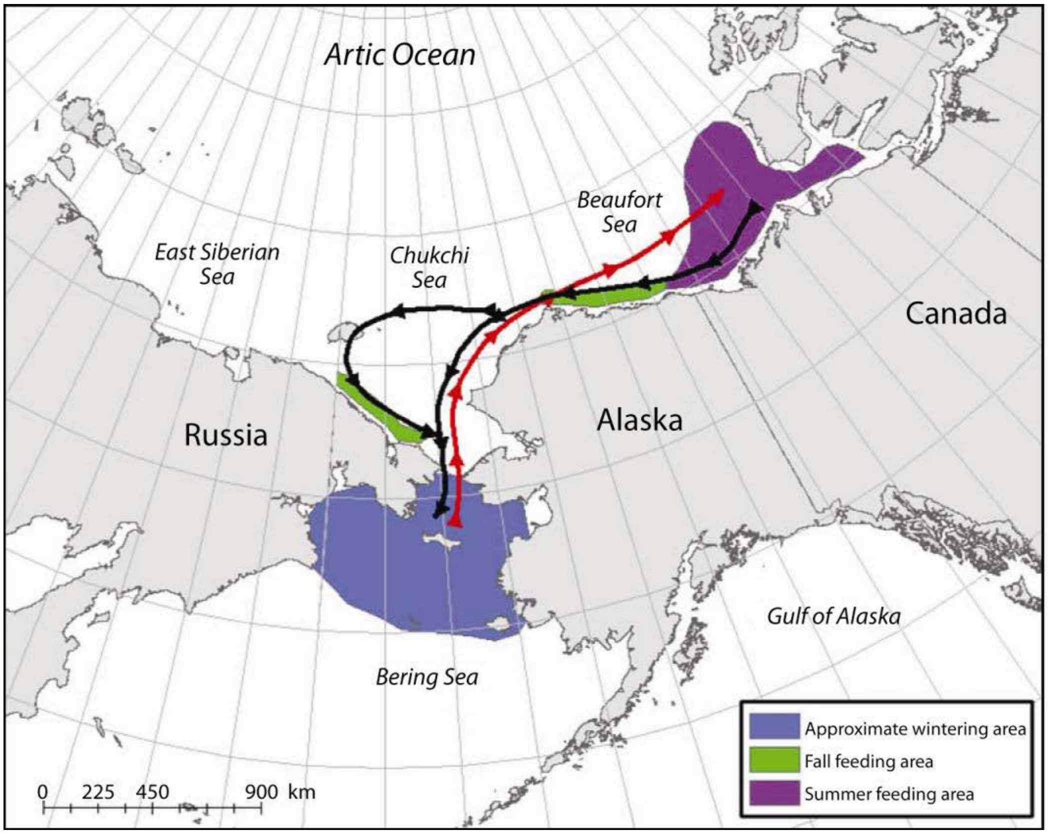


**Figure 6. Generalized migration route, feeding areas, and wintering area for Western arctic bowhead whale (Moore and Laidre 2006).**

The vast majority of the bowhead population migrates to the Bering Sea during the fall and does not return eastwards through the Beaufort Sea again until the spring. During the eastward (spring) migration, the whales are distributed far offshore. While a few whales may occur in the central Beaufort Sea area throughout the summer, most of the population spends the summer in the eastern Beaufort Sea before passing through again during the latter part of summer and fall as bowheads migrate west to over winter in the Bering Sea. Bowhead whales are most likely to be encountered during the fall migration when bowhead whales travel closer to shore (than during the spring migration) in water ranging from 15 to 200 m deep (50 to 656 ft; Miller et al. 2002, Clarke et al. 2012). The fall migration trajectory varies annually and is influenced by ice presence (Moore and Reeves 1993); during years with less ice the whales tend to migrate closer to shore, along the barrier islands. Bowhead whale sightings during the fall migration are also lower in heavy ice years. Treacy et al. (2006) found that the main migration corridor for bowhead whales during the fall migration was 73.4 km (46 mi) offshore in years of heavy ice conditions, 49.3 km (31 mi) offshore during moderate ice conditions, and 31.2 km (19 mi) off shore during light ice conditions.

The Aerial Surveys of Arctic Marine Mammals (ASAMM) project is a continuation of the Bowhead Whale Aerial Survey Project and Chukchi Offshore Monitoring in Drilling Area marine mammal aerial survey project. Through these projects, aerial surveys have been conducted in the Alaska Beaufort Sea in late summer and autumn since 1979 (Ljungblad et al. 1986, Ljungblad et al. 1987, Monnett and Treacy 2005, Treacy et al. 2006, Clarke et al. 2012, Clarke et al. 2013a, Clarke et al. 2013b). Figure 7 displays bowhead whale sightings near the project area. The ASAMM database and annual reports are available from the NMFS Marine Mammal Laboratory web page: http://www.afsc.noaa.gov/NMML/cetacean/.

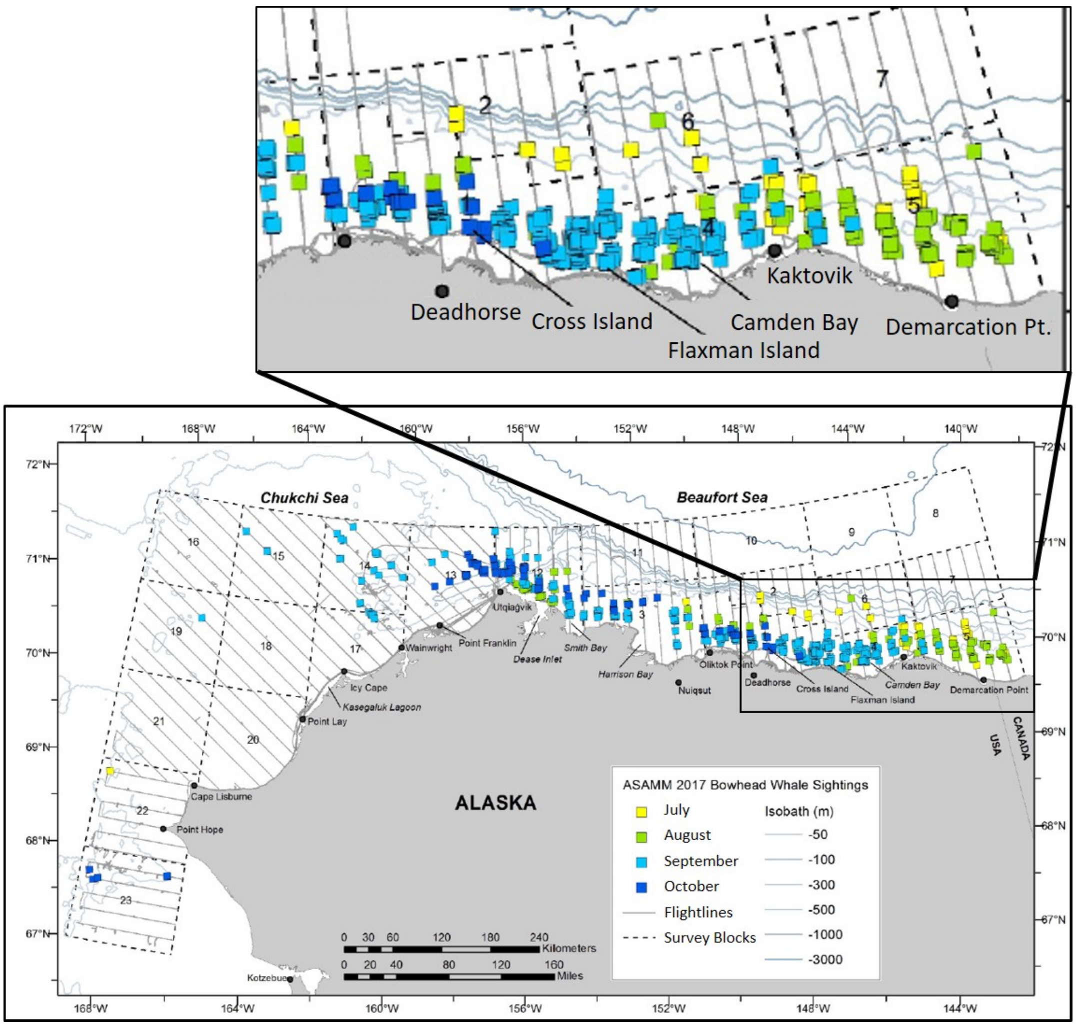


**Figure 7. ASAMM 2017 bowhead sightings plotted by month, with transect, search, and circling effort (Clarke et al. 2018).**

NMFS categorizes bowhead whales in the low-frequency cetacean (i.e., baleen whale) functional hearing group, with an estimated hearing range of 7 Hz to 35 kHz (NMFS 2018). Inferring from their vocalizations, bowhead whales should be most sensitive to frequencies between 20 Hz and 5 kHz, with maximum sensitivity between 100 Hz and 500 Hz (Erbe 2002b).

Additional information on bowhead whale biology and habitat is available at:

https://www.fisheries.noaa.gov/species/bowhead-whale
https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock

## 4.10 Arctic ringed seals

Arctic ringed seals may occur along the marine transit route and adjacent to the Coastal Plain. Under the MMPA, NMFS recognizes one stock of Arctic ringed seals, the Alaska stock, whose range includes the Beaufort and Chukchi seas as well as the northern Bering Sea, with few seals ranging as far south as the Aleutian Islands. The Arctic ringed seal was listed as threatened under the ESA on December 28, 2012, primarily due to expected impacts on the population from declines in sea ice and snow cover stemming from climate change within the foreseeable future (77 FR 76706).

Though a precise population estimate for the entire Alaska stock is not available, research programs have recently developed new survey methods and partial, but useful, abundance estimates. In spring of 2012 and 2013, U.S. and Russian researchers conducted image-based aerial abundance and distribution surveys of the entire Bering Sea and Sea of Okhotsk (Moreland et al. 2013). The data from these surveys are still being analyzed, but for the U.S. portion of the Bering Sea, Boveng et al. (2017) reported model-averaged abundance estimates of 186,000 and 119,000 ringed seals in 2012 and 2013, respectively. It was noted that these estimates should be viewed with caution because a single point estimate of availability (haul-out correction factor) was used and the estimates did not include ringed seals in the shorefast ice zone, which was surveyed using a different method. The authors suggested that the difference in seal density between years may reflect differences in the numbers of ringed seals using Russian versus U.S. waters between years, and they noted that if this was the case, the eventual development of comprehensive estimates of abundance for ringed seals in the Bering Sea that incorporate data in Russian waters may show less difference between years.

During spring and summer of 2019, the NMFS AKR Stranding Network received reports of many dead ice seals; as of September 20, 2019, there were 166 reports, including at least 34 ringed seals and 49 bearded seals (and 62 unidentified seals, some of which may have been ringed seals). The cause, or causes, of these deaths is currently being investigated by NMFS, and on August 23, 2019, NMFS declared an Unusual Mortality Event (UME)[2] from June 1, 2018, to present. All age classes of seals have been reported and a subset have been sampled for genetics and harmful algal bloom exposure; results are pending.

*Distribution*

The Arctic subspecies of ringed seal has a circumpolar distribution and is found in all seasonally ice-covered waters throughout the Arctic basin and adjacent waters. They remain with the ice most of the year and use it as a haul-out platform for resting, pupping and nursing in late winter to early spring, and molting in late spring to early summer. During summer, ringed seals range hundreds to thousands of kilometers to forage along ice edges or in highly productive open-water areas (Harwood and Stirling 1992, Freitas et al. 2008, Kelly et al. 2010b, Harwood et al. 2015). Harwood and Stirling (1992) reported that in late summer and early fall, aggregations of ringed seals occur in open-water in some parts of their study area in the southeastern Canadian Beaufort Sea where primary productivity was thought to be high. Harwood et al. (2015) also found that in the fall, several satellite-tagged ringed seals showed localized movements offshore east of Point Barrow in an area where bowhead whales are known to concentrate in the fall to feed on

[2] https://www.fisheries.noaa.gov/alaska/marine-life-distress/frequent-questions-2019-ice-seal-unusual-mortality-event

zooplankton. With the onset of freeze-up in the fall, ringed seal movements become increasingly restricted. Seals that have summered in the Beaufort Sea are thought to move west and south with the advancing ice pack, with many seals dispersing throughout the Chukchi and Bering seas while some remain in the Beaufort Sea (Frost and Lowry 1984, Crawford et al. 2012, Harwood et al. 2012).

In Alaskan waters, during winter and early spring when sea ice is at its maximal extent, ringed seals are abundant in the northern Bering Sea, Norton and Kotzebue Sounds, and throughout the Chukchi and Beaufort seas (Frost 1985, Kelly 1988a). Passive acoustic monitoring (PAM) of ringed seals from a high frequency recording package deployed at a depth of 787 ft. (240 m) in the Chukchi Sea (65 nm) 120 km north-northwest of Barrow, Alaska, detected ringed seals in the area between mid- December and late May over the four year study (Jones et al. 2014). With the onset of the fall freeze, ringed seal movements become increasingly restricted, and seals will either move west and south with the advancing ice pack with many seals dispersing throughout the Chukchi and Bering Seas, or remain in the Beaufort Sea (Frost and Lowry 1984, Crawford et al. 2012, Harwood et al. 2012). Kelly et al. (2010a) tracked home ranges for ringed seals in the subnivean period (using shorefast ice); the size of the home ranges varied from less than 1 km up to 27.9 $km^2$ (median is 0.62 $km^2$ for adult males and 0.65 $km^2$ for adult females). Most (94 percent) of the home ranges were less than 3 $km^2$ during the subnivean period (Kelly et al. 2010a). Near large polynyas, ringed seals maintain ranges up to 7,000 $km^2$ during winter and 2,100 $km^2$ during spring (Born et al. 2004). Some adult ringed seals return to the same small home ranges they occupied during the previous winter (Kelly et al. 2010a). The size of winter home ranges can, however, vary by up to a factor of 10 depending on the amount of fast ice; seal movements were more restricted during winters with extensive fast ice, and were much less restricted where fast ice did not form at high levels (Harwood et al. 2015).

Ringed seal pups are born and nursed in the spring (March through May), normally in subnivean birth lairs, with the peak of pupping occurring in early April (Frost and Lowry 1981). Subnivean lairs provide thermal protection from cold temperatures, including wind chill effects, and some protection from predators (Smith and Stirling 1975, Smith 1976). These lairs are especially important for protecting pups. Arctic ringed seals appear to favor shore-fast ice as whelping habitat. Ringed seal whelping has also been observed on both nearshore and offshore drifting pack ice (e.g., Lentfer 1972). The pups spend time learning diving skills, using multiple breathing holes, and nursing and resting in lairs (Smith and Lydersen 1991, Lydersen and Hammill 1993).

Ringed seals feed year-round, but forage most intensively during the open-water period and early freeze-up, when they spend 90 percent or more of their time in the water (Kelly et al. 2010a). Many studies of the diet of Arctic ringed seal have been conducted and although there is considerable variation in the diet regionally, several patterns emerge. Most ringed seal prey is small (in the 5-10 cm (2-4 in) length range for fishes and the 2-6 cm (0.8-2.4 in) length range for crustaceans), and preferred prey tends to be schooling species that form dense aggregations. Quakenbush et al. (2011b) found fish were consumed more frequently in the 2000s than in the 1960s and 1970s, and Arctic cod, saffron cod, sculpin, rainbow smelt, and walleye pollock were identified as the dominant fishes, while mysids, amphipods, and shrimp were the dominant invertebrate species in ringed seal diets.

Ringed seals produce underwater vocalizations which range from approximately 0.1 to 1.0 kHz (Jones et al. 2014) in association with territorial and mating behaviors. Underwater audiograms for ringed seals indicate that their hearing is most sensitive at 49 dB re 1 µPa (12.8 kHz) in water, and 12 dB re 20 µPa (4.5 kHz) in air (Sills et al. 2015). NMFS defines the functional hearing range for phocids (seals) as 50 Hz to 86 kHz (NMFS 2016c).

Sills et al. (2015) suggested that because ringed seal hearing is sensitive for a greater frequency range than their vocalizations, their hearing is likely not only used for detection of the vocalizations conspecifics (Sills et al. 2015), but may also be important in locating breathing holes and the ice edge, detection of predators, locating prey, and orienteering (Elsner et al. 1989, Wartzok et al. 1992, Miksis-Olds and Madden 2014). Sills et al. (2015) further reported that ringed seal hearing appears to be resistant to masking across a range of frequencies, as indicated by their enhanced ability to detect signals from background noise.

Additional information on ringed seals can be found at:
http://www.nmfs.noaa.gov/pr/species/mammals/seals/ringed-seal.html

## 4.11 Bearded Seal (Beringia DPS)

Bearded seals may occur along the marine transit route and adjacent to the Coastal Plain. There are two recognized subspecies of the bearded seal: *E. b. barbatus*, often described as inhabiting the Atlantic sector (Laptev, Kara, and Barents seas, North Atlantic Ocean, and Hudson Bay; Rice 1998); and *E. b. nauticus*, which inhabits the Pacific sector (remaining portions of the Arctic Ocean and the Bering and Okhotsk seas; Ognev 1935, Scheffer 1958, Manning 1974, Heptner et al. 1976). Based on evidence for discreteness and ecological uniqueness, NMFS concluded that the *E. b. nauticus* subspecies consists of two DPSs: the Okhotsk DPS in the Sea of Okhotsk, and the Beringia DPS encompassing the remainder of the range of this subspecies (75 FR 77496; December 10, 2010). Only the Beringia DPS is found in U.S. waters (and the action area), and this portion is recognized by NMFS as a single Alaska stock.

The Beringia DPS was listed as threatened under the ESA on December 28, 2012 (77 FR 76739) due to the projected loss of sea ice and alteration of prey availability from climate change in the foreseeable future.

A precise population estimate for the entire Alaska stock is not available, but research programs have recently developed new survey methods and partial, but useful, abundance estimates. In spring of 2012 and 2013, U.S. and Russian researchers conducted aerial abundance and distribution surveys over the entire Bering Sea and Sea of Okhotsk (Moreland et al. 2013). The data from these image-based surveys are still being analyzed, but for the U.S. portion of the Bering Sea, Boveng et al. (2017) reported model-averaged abundance estimates of 170,000 and 125,000 bearded seals in 2012 and 2013, respectively. These results reflect use of an estimate of availability (haulout correction factor) based on data from previously deployed satellite tags. The authors suggested that the difference in seal density between years may reflect differences in the numbers of bearded seals using Russian versus U.S. waters between years, and they noted that if this was the case, the eventual development of comprehensive estimates of abundance for bearded seals in the Bering Sea that incorporate data in Russian waters may show less difference between years.

During spring and summer of 2019, the NMFS AKR Stranding Network received reports of many dead ice seals; as of September 20, 2019, there were 166 reports, including 49 bearded seals (and 62 unidentified seals, some of which may have been bearded seals). The cause, or causes, of these deaths is currently being investigated by NMFS, and on August 23, 2019, NMFS declared an Unusual Mortality Event (UME)[3] from June 1, 2018, to present. All age classes of seals have been reported and a subset have been sampled for genetics and harmful algal bloom exposure; results are pending.

Bearded seals have a circumpolar distribution that does not extend farther north than 85° N (Folkens et al. 2002, Muto et al. 2017). The Beringia DPS of the bearded seal includes all bearded seals from breeding populations in the Arctic Ocean and adjacent seas in the Pacific Ocean between 145°E longitude (Novosibirskiye Archipelago) in the East Siberian Sea and 130°W longitude in the Canadian Beaufort Sea, except west of 157°W longitude in the Bering Sea and west of the Kamchatka Peninsula (where the Okhotsk DPS is found). The bearded seal's effective range is generally restricted to areas where seasonal sea ice occurs over relatively shallow waters. Cameron et al. (2010) defined the core distribution of bearded seals as those areas of known extent that are in waters less than 500 m (1,640 ft) deep.

Bearded seals are closely associated with sea ice, particularly during the critical life history periods related to reproduction and molting, and can be found in a broad range of ice types. They generally prefer moving ice that produces natural openings and areas of open-water (Heptner et al. 1976, Fedoseev 1984, Nelson et al. 1984). They usually avoid areas of continuous, thick, shorefast ice and are rarely seen in the vicinity of unbroken, heavy, drifting ice or large areas of multi-year ice (Fedoseev 1965, Burns and Harbo 1972, Frost et al. 1979, Burns 1981, Smith and Hammill 1981, Fedoseev 1984, Nelson et al. 1984). Within the U.S. range of the Beringia DPS, the extent of favorable ice conditions for bearded seals is most restricted in the Beaufort Sea, where there is a relatively narrow shelf with suitable water depths. There is more suitable ice floating over suitable water depths in the Chukchi and Bering Seas (Burns 1981). During winter, the central and northern parts of the Bering Sea shelf where heavier pack ice occurs have the highest densities of adult bearded seals (Heptner et al. 1976, Burns and Frost 1979, Burns 1981, Nelson et al. 1984, Cameron et al. 2018), possibly reflecting the favorable ice conditions there. Cameron et al. (2018) found that bearded seals tended to prefer areas of between 70 and 90 percent ice coverage, and were typically more abundant in offshore pack ice 37 to 185 km (20 to 100 nautical miles [nm]) from shore than within 37 km (20 nm) from shore. It is thought that in the fall and winter most bearded seals move south with the advancing ice edge through Bering Strait into the Bering Sea where they spend the winter, and in the spring and early summer, as the sea ice melts, many of these seals move north through the Bering Strait into the Chukchi and Beaufort Seas (Burns 1967a, Burns and Frost 1979, Burns 1981, Cameron and Boveng 2007, Cameron and Boveng 2009, Cameron et al. 2018). However, some unknown proportion of the population occurs in the Chukchi and Beaufort Seas over winter (MacIntyre et al. 2013, MacIntyre et al. 2015). Some seals, mostly juveniles, have been observed hauled out on sandy islands near Barrow (Cameron et al. 2010).

Beringia DPS bearded seals are widely distributed throughout the northern Bering, Chukchi, and

[3] https://www.fisheries.noaa.gov/alaska/marine-life-distress/frequent-questions-2019-ice-seal-unusual-mortality-event

Beaufort Seas and are most abundant north of the ice edge zone (MacIntyre et al. 2013). Bearded seals with pups have been observed in the Beaufort, Chukchi, and Bering Seas in areas of drifting pack ice along the ice edge, but also in the heavy winter pack ice where there are leads (Burns and Frost 1979, Cameron et al. 2010).Telemetry data from Boveng and Cameron (2013) showed that large numbers of bearded seals move south in fall/winter as sea ice forms and move north as the seasonal sea ice melts in the spring. The highest densities of bearded seals are found in the central and northern Bering Sea shelf during winter (Fay 1974, Heptner et al. 1976, Burns and Frost 1979, Braham et al. 1981, Burns 1981, Nelson et al. 1984). In late winter and early spring bearded seals are widely (not uniformly) ranging from the Chukchi Sea south to the ice front in the Bering Sea usually on drifting pack ice (Muto et al. 2016). Bearded seal calls were recorded throughout the year in the Beaufort Sea (MacIntyre et al. 2013) and northeastern Chukchi Sea (Jones et al. 2014), and the timing of the peak calling periods in both of these studies (increasing through spring with peak rates in April) suggest that bearded seals are breeding in these areas. During the open-water period the Beaufort Sea likely supports fewer bearded seals than the Chukchi Sea because of the more extensive foraging habitat (i.e., on the continental shelf) available to bearded seals there.

Individual male bearded seals use distinct vocalizations during the breeding season which are believed to advertise mate quality, signal competing claims on reproductive rights, or to identify territory. Studies in the fjords of the Svalbard Archipelago and shore leads in the Chukchi Sea of Alaska have suggested site fidelity of males within and between years supporting earlier claims that males defend aquatic territories (Cleator et al. 1989, Cleator and Stirling 1990, Van Parijs et al. 2003, 2004, Van Parijs and Clark 2006, Risch et al. 2007). Males exhibiting territoriality maintain a $\leq 12$ km$^2$ core area, unlike wandering males that call across several larger core areas (Van Parijs et al. 2003, 2004, Van Parijs and Clark 2006, Risch et al. 2007), and scars on the males suggest fighting may be involved in defending territories as well.

Bearded seal diets vary with age, location, season, and changes in prey availability (Kelly 1988b). They are mostly benthic feeders (Burns 1981), consuming a variety of invertebrates (e.g., crabs, shrimp, clams, worms, and snails; Quakenbush et al. 2011a), fish (including arctic and saffron cod, flounders, and sculpins), and octopuses (Burns 1981, Kelly 1988b, Reeves et al. 1992, Hjelset et al. 1999, Cameron et al. 2010). Unlike walrus that “root” in the soft sediment for benthic organisms, bearded seals “scan” the surface of the seafloor with their highly sensitive whiskers, burrowing only in the pursuit of prey (Marshall et al. 2006, Marshall et al. 2008). Bearded seals also feed on ice-associated organisms when practicable, allowing the seals to live in areas with water depths considerably deeper than 200 m if necessary.

Male bearded seals produce a variety of underwater vocalizations ranging from approximately 0.2 to 4.3 kHz (Jones et al. 2014) which can travel up to 30 kilometers (Cleator et al. 1989, Van Parijs et al. 2001, Van Parijs et al. 2003, 2004, Van Parijs and Clark 2006) and are used to find mates (Cameron et al. 2010). Mating calls peak during and after pup rearing (Wollebaeck 1927, Freuchen 1935, Dubrovskii 1937, Chapskii 1938), and evidence suggests these calls originate only from males (Burns 1967b, Poulter 1968, Ray et al. 1969, Burns 1981, Stirling 1983, Cleator et al. 1989, Cleator and Stirling 1990, Van Parijs et al. 2001, Van Parijs et al. 2003, 2004, Davies et al. 2006, Van Parijs and Clark 2006, Risch et al. 2007).

Although no audiograms have been published for bearded seals (Halliday et al. 2017), it is likely that their hearing is similar to other phocids (Terhune 1999). NMFS classifies bearded seals in the phocid pinniped ("true" seal) functional hearing group, with an applied frequency range between 0.050 and 86 kHz (NMFS 2016c).

Additional information on Beringia DPS bearded seals can be found at: http://www.fisheries.noaa.gov/pr/species/mammals/seals/bearded-seal.html.

# 5. ENVIRONMENTAL BASELINE

The "environmental baseline" includes the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

## 5.1 Climate Change

There is widespread consensus within the scientific community that atmospheric temperatures are increasing and that this will continue for at least the next several decades (Watson and Albritton 2001, Oreskes 2004). There is also consensus within the scientific community that this warming trend will alter current weather patterns and patterns associated with climatic phenomena, including the timing and intensity of extreme events such as heat waves, floods, storms, and wet-dry cycles. Warming of the climate system is unequivocal, as is evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (Intergovernmental Panel on Climate Change 2007, IPCC 2014).

The average global surface temperature rose by 0.85º C from 1880 to 2012, and it continues to rise at an accelerating pace (IPCC 2014); the 15 warmest years on record since 1880 have occurred in the first 17 years of the 21$^{st}$ century, with 2016 being the warmest (NCEI 2019). The warmest year on record for average ocean temperature was 2019 (NCEI 2019). Since 2000, the Arctic (latitudes between 60 and 90º N) has been warming at three times the rate of lower latitudes (Comiso and Hall 2014) due to "Arctic amplification," a characteristic of the global climate system influenced by changes in sea ice extent, atmospheric and oceanic heat transports, cloud cover, black carbon, and many other factors (Serreze and Barry 2011, Richter-Menge et al. 2017).

Direct effects of climate change include increases in atmospheric temperatures, decreases in sea ice, and changes in sea surface temperatures, oceanic pH, patterns of precipitation, and sea level. Indirect effects of climate change have impacted, are impacting, and will continue to impact marine species in the following ways (IPCC 2014):

- Shifting abundances
- Changes in distribution
- Changes in timing of migration
- Changes in periodic life cycles of species

Climate change is likely to have its most pronounced effects on species whose populations are already in tenuous positions (Isaac 2009), including ESA-listed species. Therefore, we expect the extinction risk of at least some ESA-listed species to increase with global warming. Cetaceans with restricted distributions linked to water temperature may be particularly vulnerable to range restriction (Learmonth et al. 2006, Isaac 2009). MacLeod (2009) estimated that, based on expected shifts in water temperature, 88 percent of cetaceans will be affected by climate change, 47 percent will be negatively affected, and 21 percent will be put at risk of extinction. Of greatest concern are cetaceans with ranges limited to non-tropical waters, and preferences for shelf habitats (e.g. North Pacific right whales) (MacLeod 2009).

Arctic sea ice extent, in general, has been in decline since 1979 and has a negative trend (Jeffries et al. 2014). The National Snow and Ice Data Center reported that the June sea ice extent has decreased by 4.08 percent per decade since 1980 (Figure 8). Arctic sea ice thickness and annual minimum sea ice extent (i.e., September sea ice extent) have accelerated in their rate of decline considerably in the first decade of the 21st century and approximately three-quarters of summer Arctic sea ice volume has been lost since the 1980s (IPCC 2013). Perennial sea ice extent has declined at a rate of approximately 12 percent per decade and multi-year ice extent is declining at rate of approximately 15 percent per decade (Comiso 2012). Wang and Overland (2012) estimated that the Arctic will be nearly ice-free (i.e., sea ice extent will be less than 1 million $km^2$) during the summer in the 2030s.

For 650,000 years or more, the average global atmospheric carbon dioxide ($CO_2$)concentration varied between 180 and 300 parts per million (ppm), but since the beginning of the industrial revolution in the late 1700s, atmospheric $CO_2$ concentrations have been increasing rapidly, primarily due to anthropogenic inputs (Fabry et al. 2008). The world's oceans have absorbed approximately one-third of the anthropogenic $CO_2$ released, which has curtailed the increase in atmospheric $CO_2$ concentrations (Sabine et al. 2004). Despite the oceans' role as large carbon sinks, in 2016, the mean monthly average atmospheric $CO_2$ level exceeded 400 ppm and continues to rise.

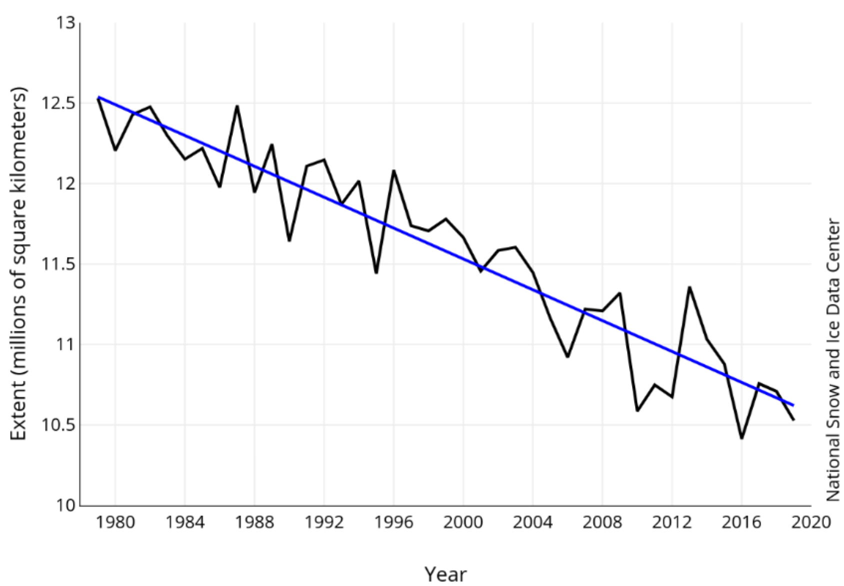


**Figure 8. Monthly June Arctic Sea ice extent for 1979 to 2019 shows a decline of 4.08 percent per decade (National Snow and Ice Data Center, https://nsidc.org/arcticseaicenews/; accessed July 8, 2019).**

As the oceans absorb more $CO_2$, the pH of seawater is reduced. This process is commonly referred to as ocean acidification. Ocean acidification reduces the saturation states ($\Omega$) of certain biologically important calcium carbonate minerals like aragonite and calcite that many organisms use to form and maintain shells (Reisdorph and Mathis 2014). When seawater is supersaturated with these minerals ($\Omega > 1$), calcification (growth) of shells is favored. Likewise, when $\Omega < 1$, dissolution is favored (Feely et al. 2009).

High latitude oceans have naturally lower saturation states of calcium carbonate minerals than more temperate or tropical waters (Fabry et al. 2009; Jiang et al. 2015), making Alaska's oceans more susceptible to the effects of ocean acidification. Large inputs of low-alkalinity freshwater from glacial runoff and melting sea ice reduce the buffering capacity of seawater to changes in pH (Reisdorph and Mathis 2014). As a result, seasonal undersaturation of aragonite has been detected in the Bering Sea at sampling stations near the outflows of the Yukon and Kuskokwim rivers (Fabry et al. 2009), Glacier Bay (Reisdorph and Mathis 2014), and the Chukchi Sea (Fabry et al. 2009). By 2050, all of the Arctic Ocean is predicted to be undersaturated with respect to aragonite (Feely et al. 2009).

Changes in seawater chemistry as a result of ocean acidification could have severe consequences for calcifying organisms, particularly pteropods. Pteropods are a type of zooplankton that form shells from aragonite, are abundant in high latitude surface waters, and form the base of many food webs (Orr et al. 2005). Pteropods are prey for many species of carnivorous zooplankton; fishes including salmon, mackerel, herring, and cod; and baleen whales (Orr et al. 2005), and are often considered an indicator species for ecosystem health. Under increasingly acidic conditions, pteropods may not be able to grow and maintain shells, and it is uncertain if they may be able to evolve quickly enough to adapt to changing ocean conditions (Fabry et al. 2009).

Ocean acidification may cause a variety of species- and ecosystem-level effects in high latitude ecosystems. Species-level effects may include reductions in the calcification rates of numerous planktonic and benthic species, alteration of physiological processes such as pH buffering, hypercapnia, ion transport, acid-base regulation, mortality, metabolic suppression, inhibited blood-oxygen binding, and reduced fitness and growth (Fabry et al. 2008). Ecosystem effects could include altered species compositions and distributions, trophic dynamics, rates of primary productivity, and carbon and nutrient cycling (Fabry et al. 2008).

Additionally, as the ocean becomes more acidic, low frequency sounds (1-3 kHz and below) travel farther because the concentrations of certain ions that absorb acoustic waves decrease with decreasing pH (Brewer and Hester 2009).

Changes in sea ice and ocean acidification are expected to result in changes to the biological environment, causing shifts, expansion, or retraction of species' home ranges, changes in behavior, and changes in prey availability and population parameters of species. Research in recent years has focused on the effects of naturally-occurring or man-induced global climate regime shifts and the potential for these shifts to cause changes in habitat structure over large areas. Although many of the forces driving global climate regime shifts may originate outside the Arctic, the impacts of global climate change are exacerbated in the Arctic (ACIA 2005, Intergovernmental Panel on Climate Change 2014a). These threats will be most pronounced for ice-obligate species such as the polar bear, walrus, ringed seal, and bearded seal (Moore and Huntington 2008).

There have recently been increases of subarctic species seasonally found in the Arctic. With increasing sea-surface temperatures in the Arctic, instances of northward movement of non-native species and range-expansion of sub-Arctic species into this ecosystem have already been seen, and more is expected in the coming years (Fernandez 2014). This northward movement can impact Arctic species by altering Arctic marine food webs (Kortsch et al. 2015), introducing novel diseases (Burek et al. 2008, Bossart 2011), increasing abundance of predators (e.g., Ferguson et al. 2010), and competition for resources with non-native species (Kovacs et al. 2011).

## 5.2 Fisheries

Commercial, subsistence, and recreational fisheries along the marine transit route portion of the action area may harm or kill listed marine species through direct bycatch, gear interactions (entrapments and entanglements), vessel strikes, contaminant spills, habitat modification, competition for prey, and behavioral disturbance or harassment.

Worldwide, fisheries interactions have an impact on many marine mammal species. More than 97 percent of whale entanglements are caused by derelict fishing gear (Baulch and Perry 2014). There is also concern that mortality from entanglement may be underreported, as many marine mammals that die from entanglement tend to sink rather than strand ashore. Entanglement may also make marine mammals more vulnerable to additional dangers, such as predation and ship strikes, by restricting agility and swimming speed.

Additionally, commercial fisheries may indirectly affect whales and seals by reducing the amount of available prey or affecting prey species composition. In Alaska, commercial fisheries target known prey species of ESA-listed whales, sea lions, and seals, such as pollock and cod, and bottom-trawl fisheries may disturb habitat for bottom-dwelling prey species of ESA-listed species.

Due to their highly migratory nature, many species considered in this opinion have the potential to interact with fisheries both in and outside of the action area. Assessing the impact of fisheries on such species is difficult due to the large number of fisheries that may interact with the animals and the inherent complexity of evaluating ecosystem-scale effects. The NMFS Bycatch Report estimates bycatch of marine mammals (and other taxa) from observer data and self-reported logbook data (NMFS 2016d). Additionally, under the MMPA, NMFS maintains an annual list of fisheries (LOF) that categorizes U.S. commercial fisheries according to the level of interactions that result in incidental mortality or serious injury of marine mammals. Detailed information on U.S. commercial fisheries in Alaska waters, including observer programs and coverage and observed incidental takes of marine mammals, is presented in Appendices 3-6 of the Alaska Stock Assessment Reports (SARs) (Muto et al. 2017).

The North Pacific Fishery Management Council (NPFMC) adopted an Arctic Fishery Management Plan (FMP) which closed all Federal waters of the Chukchi and Beaufort seas to commercial fishing for any species of finfish, mollusks, crustaceans, and all other forms of marine animal and plant life, with limited exceptions. The Arctic FMP does not regulate subsistence or recreational fishing or State of Alaska-managed fisheries in the Arctic.

Because no commercial fisheries occur in the Chukchi and Bering Seas, any observed serious injury or mortality to listed species in the Arctic that can be associated with commercial fisheries is currently attributable to interactions with fisheries in other areas, including in the Bering

Sea/Aleutian Islands management area (BSAI) and Gulf of Alaska. For example, bowhead whales in the Arctic have been observed entangled in pot fishing gear thought to be from the Bering Sea (see Status of Species section and Muto et al. (2017)).

## 5.3 Oil and Gas

Offshore petroleum exploration activities have been conducted in the action area both within State of Alaska waters and the Outer Continental Shelf (OCS) of the Beaufort and Chukchi Seas, and nearby in Canada's eastern Beaufort Sea off the Mackenzie River Delta, in Canada's Arctic Islands, and in the Russian Arctic, and around Sakhalin Island in the Sea of Okhotsk (NMFS 2016a).

Offshore oil and gas development in Alaska poses a number of threats to listed marine species, including increased ocean noise, risk of hydrocarbon spills, production of waste liquids, habitat alteration, increased vessel traffic, and risk of ship strike. NMFS reviewed the potential effects of oil and gas development in a Final Environmental Impact Statement for the effects of oil and gas activities in the Arctic Ocean (NMFS 2013). NMFS has conducted numerous Section 7 consultations on oil and gas activities in the Chukchi and Beaufort Seas (available at https://alaskafisheries.noaa.gov/pr/biological-opinions/). Many of the consultations have authorized the take (by harassment) of bearded and ringed seals from sounds produced during geophysical (including seismic) surveys and drilling operations conducted by leaseholders during open water (i.e., summer) months.

Geophysical seismic survey activity has been described as one of the loudest man-made underwater noise sources, with the potential to harass or harm marine mammals (Richardson et al. 1995). Controlled-source, deep-penetration reflection seismology, similar to sonar and echolocation, is the primary tool used for onshore and offshore oil exploration (Smith et al. 2017). Seismic surveys are conducted by towing long arrays of sensors affixed to wires at approximately 10 knots behind large vessels following a survey grid. High power air cannons are fired below the water surface, and the sound waves propagate through the water and miles into the seafloor. When those soundwaves encounter strong impedance contrasts (e.g., between water and the ocean floor, or between different densities of substrates), a reflection signal is detected by the sensors. Those signals can be interpreted to determine the stratigraphy of the substrate and identify oil and gas deposits.

Seismic surveying has acoustic impacts on the marine environment. The noise generated from seismic surveys has been linked to behavioral disturbance of wildlife, masking of cetacean communication, and potential auditory injury to marine mammals in the marine environment (Smith et al. 2017)

Seismic surveys are often accompanied by test drilling. Test drilling involves fewer direct impacts than seismic exploration, but the potential risks of test drilling, such as oil spills, may have broader consequences (Smith et al. 2017).

Oil and gas exploration, including seismic surveys, occur within the action area and across the ranges of many of the species considered in this Biological Opinion.

### 5.3.1 Spills

Since 1975, 84 exploration wells, 14 continental offshore stratigraphic test wells (i.e., COST), and six development wells have been drilled on the Arctic OCS (BOEM 2012). Historical data on offshore oil spills for the Alaska Arctic OCS region consists of all small spills (i.e., less than 1,000 barrels [31,500 gallons]) and cannot be used to create a distribution for statistical analysis (NMFS 2013). Instead, agencies use a fault tree model[4] to represent expected spill frequency and severity of spills in the Arctic. Table 3 shows the assumptions the Bureau of Ocean Energy Management (BOEM) presented regarding the size and frequency of spills in the Beaufort and Chukchi Seas Planning Area in its final programmatic EIS for the Outer Continental Shelf oil and gas leasing program for 2012 to 2017 (BOEM 2012).

**Table 3. Oil spill assumptions for the Beaufort and Chukchi Seas Planning Areas, 2012 to 2017**

| Spill Type | Assumed Spill Volume (barrels) | Assumed Number of Spill Events | Maximum Volume of Assumed Spill Events (barrels) |
|---|---|---|---|
| Small | ≥ 1 to < 50 | 50 to 90 | 9,310 |
| | ≥ 50 to < 1,000 | 10 to 35 | 34,965 |
| Large | ≥ 1,000 | - | - |
| Pipeline | 1,700 | 1 to 2 | 3,400 |
| Platform | 5,100 | 1 | 5,100 |
| | | **TOTAL** | **52,775** |
| Table adapted from BOEM (2012) | | | |

Increased oil and gas development in the U.S. Arctic has led to an increased risk of various forms of pollution to whale and seal habitat, including oil spills, other pollutants, and nontoxic waste (Allen and Angliss 2015).

### 5.3.2 Pollutants and Discharges (Excluding Spills)

Previous development and discharges in portions of the action area are the source of multiple pollutants that may be bioavailable (i.e., may be taken up and absorbed by animals) to ESA-listed species or their prey items (NMFS 2013). Drill cuttings and fluids contain contaminants that have high potential for bioaccumulation, such as dibenzofuran and polycyclic aromatic hydrocarbons. Historically, drill cuttings and fluids have been discharged from oil and gas developments in the Beaufort Sea near the action area, and residues from historical discharges may be present in the affected environment (Brown et al. 2010).

The Clean Water Act of 1972 (CWA) has several sections or programs applicable to activities in offshore waters. Section 402 of the CWA authorizes the U.S. Environmental Protection Agency (EPA) to administer the National Pollutant Discharge Elimination System (NPDES) permit program to regulate point source discharges into waters of the United States. Section 403 of the CWA requires that EPA conduct an ocean discharge criteria evaluation for discharges of pollutants from point sources into the territorial seas, contiguous zones, and the oceans. The Ocean Discharge Criteria (40 CFR part 125, subpart M) sets forth specific determinations of

[4] Fault tree analysis is a method for estimating spill rates resulting from the interactions of other events. Fault trees are logical structures that describe the causal relationship between the basic system components and events resulting in system failure. Fault tree models are graphical techniques that provide a systematic estimate of the combinations of possible occurrences in a system, which can result in an undesirable outcome.

unreasonable degradation that must be made before permits may be issued.

On November 28, 2012, EPA issued a NPDES general permit for discharges from oil and gas exploration facilities on the outer continental shelf and in contiguous state waters of the Beaufort Sea (Beaufort Sea Exploration General Permit (GP)). The general permit authorizes 13 types of discharges from exploration drilling operations and establishes effluent limitations and monitoring requirements for each waste stream.

On January 21, 2015, EPA issued a NPDES general permit for wastewater discharges associated with oil and gas geotechnical surveys and related activities in Federal waters of the Beaufort and Chukchi Seas (Geotechnical GP). This general permit authorizes twelve types of discharges from facilities engaged in oil and gas geotechnical surveys to evaluate the subsurface characteristics of the seafloor and related activities in federal waters of the Beaufort and Chukchi Seas.

Both the Beaufort Sea Exploration GP and the Geotechnical GP establish effluent limitations and monitoring requirements specific to each type of discharge and include seasonal prohibitions and area restrictions for specific waste streams. For example, both general permits prohibit the discharge of drilling fluids and drill cuttings to the Beaufort Sea from August 25 until fall bowhead whale hunting activities by the communities of Nuiqsut and Kaktovik have been completed. Additionally, both general permits require environmental monitoring programs to be conducted at each drill site or geotechnical site location, corresponding to before, during, and after drilling activities, to evaluate the impacts of discharges from exploration and geotechnical activities on the marine environment.

The principal regulatory mechanism for controlling pollutant discharges from vessels (grey water, black water, coolant, bilge water, ballast, deck wash, etc.) into waters of the Arctic Region OCS is also the CWA. The EPA issued a NPDES vessel general permit that applies to pollutant discharges from non-recreational vessels that are at least 24 m (79 ft) in length, as well as ballast water discharged from commercial vessels less than 24 m. This general permit restricts the seasons and areas of operation, as well as discharge depths, and includes monitoring requirements and other conditions.

In addition, the U.S. Coast Guard has issued regulations that address pollution prevention with respect to discharges from vessels carrying oil, noxious liquid substances, garbage, municipal or commercial waste, and ballast water (33 CFR part 151). The State of Alaska regulates water quality standards within three miles of the shore.

## 5.4 Vessels

The general seasonal pattern of vessel traffic in the Arctic is correlated with seasonal ice conditions, which results in the bulk of the traffic being concentrated within the months of July through October, and unaided navigation being limited to an even narrower time frame. However, this pattern appears to be rapidly changing, as ice-diminished conditions become more extensive during the summer months.

The number of unique vessels tracked via AIS in U.S. waters north of the Pribilof Islands increased from 120 in 2008 to 250 in 2012, and is expected to continue to increase in the coming years (Azzara et al. 2015).

However, the number of vessels identified in this region in 2012 includes a spike in vessel traffic associated with the offshore exploratory drilling program that was conducted by Shell on the outer continental shelf (OCS) of the Chukchi Sea that year. A comparison of the geographic distribution of vessel track lines between 2011 and 2012 provides some insight into the changes in vessel traffic patterns that may occur as a result of such activities (Figure 9). Overall, in 2012 there was a shift toward more offshore traffic, and there were also noticeable localized changes in vessel traffic concentration near Prudhoe Bay and in the vicinity of the drilling project in the Chukchi Sea (Azzara et al. 2015).

Vessel traffic can pose a threat to marine mammals primarily because of the potential disturbance from vessel noise and the risk of ship strikes.

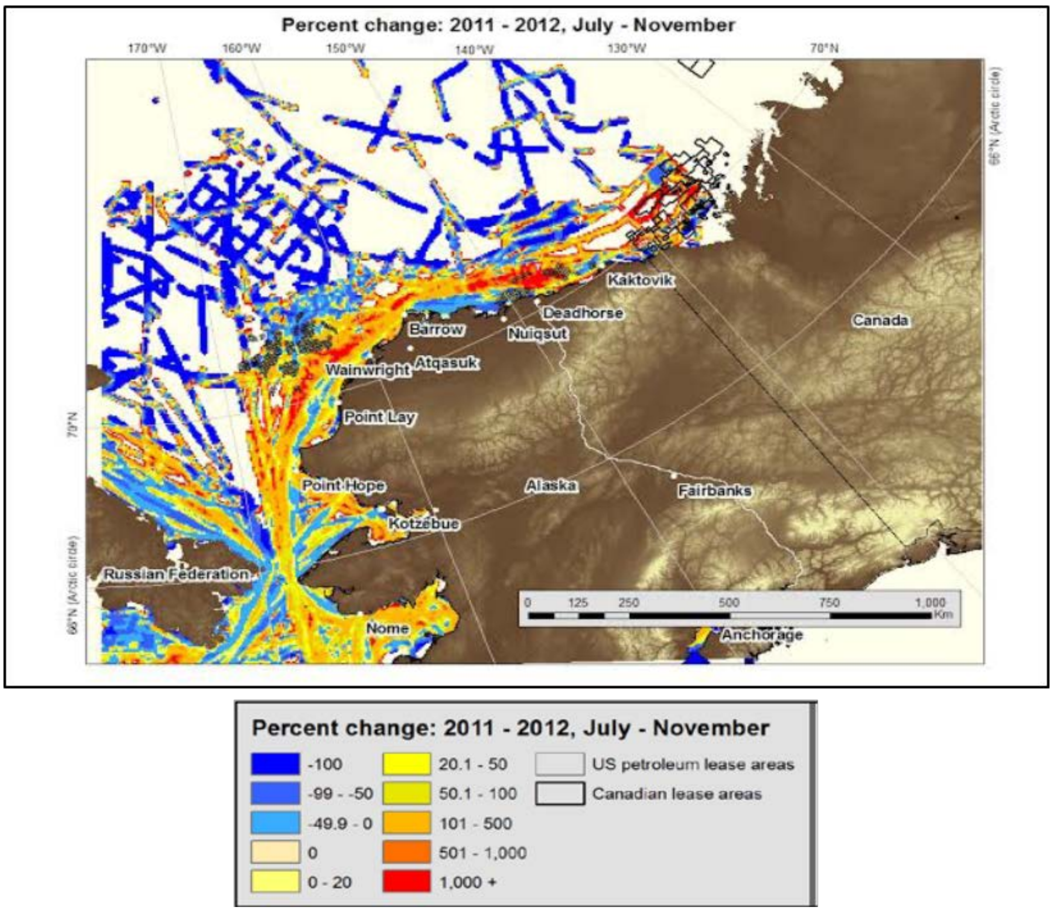


**Figure 9. Percent difference in vessel activity between 2011 and 2012 using 5-km grid cells. (Azzara et al. 2015)**

### 5.4.1 Vessel Noise

Commercial shipping traffic is a major source of low frequency (5 to 500 Hz) human generated sound in the oceans (Simmonds and Hutchinson 1996, NRC 2003). The types of vessels operating in the Beaufort Sea typically include barges, skiffs with outboard motors, icebreakers, scientific research vessels, and vessels associated with oil and gas exploration, development, and production. The primary underwater noise associated with vessel operations is the continuous noise produced from propellers and other on-board equipment. Cavitation noise is expected to dominate vessel acoustic output when tugs are pushing or towing a barges or other vessels. Other noise sources include onboard diesel generators and the main engine, but both are subordinate to propeller harmonics (Gray and Greeley 1980). Shipping sounds are often at source levels of 150 to 190 dB re 1 μPa at 1 m (BOEMRE 2011) with frequencies of 20 to 300 Hz (Greene and Moore 1995). Sound produced by smaller boats is typically at a higher frequency, around 300 Hz (Greene and Moore 1995). In shallow water, vessels more than 10 km (6.2 mi) away from a receiver generally contribute only to background-sound levels (Greene and Moore 1995). Noise from icebreakers comes from the ice physically breaking, the propeller cavitation of the vessel, and the “bubbler systems” that blow compressed air under the hull which moves ice out of the way of the ship. Broadband source levels for icebreaking operations are typically between 177 and 198 dB re 1 μPa at 1m (Greene and Moore 1995, Austin et al. 2015); however, they can be extremely variable mainly due to the varying thickness of ice that is being broken and the resulting horsepower required to break the ice.

### 5.4.2 Ship Strikes

Current shipping activities in the Arctic pose varying levels of threats to marine mammals depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with their habitats. The presence and movements of ships in the vicinity of seals can affect their normal behavior (Jansen et al. 2010) and may cause them to abandon their preferred breeding habitats in areas with high traffic (Smiley and Milne 1979, Mansfield 1983). To date, no bearded or ringed seal carcasses have been found with propeller marks. However, Sternfeld (2004) documented a single spotted seal stranding in Bristol Bay, Alaska, that may have resulted from a propeller strike.

Vessel strikes of whales occur throughout Alaska, but are less common in the action area of the proposed action than in the Gulf of Alaska and Southeast Alaska. Free-ranging marine mammals engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two (Goodwin and Cotton 2004, Lusseau 2006). These studies suggest that the behavioral responses of marine mammals to surface vessels are similar to their behavioral responses to predators.

## 5.5 Ocean Noise

In addition to vessel noise described above, ESA-listed species in the action area are exposed to several other sources of natural and anthropogenic noise. Natural sources of underwater noise include sea ice, wind, waves, precipitation, and biological noise from marine mammals, fishes, and crustaceans. Other anthropogenic sources of underwater noise of concern to listed species in Alaska include in-water construction activities such as drilling, dredging, and pile driving; oil, gas, and mineral exploration and extraction; Navy sonar and other military activities; geophysical seismic surveys; and ocean research activities. Noise impacts to listed marine mammal species state-wide from many of these activities are mitigated through ESA Section 7 consultations.

Levels of anthropogenic (human-caused) sound can vary dramatically depending on the season, type of activity, and local conditions. The combination of anthropogenic and natural noises contributes to the total noise at any one place and time.

Noise is of particular concern to marine mammals because many species use sound as a primary sense for navigating, finding prey, avoiding predators, and communicating with other individuals. As described in greater detail later in this opinion, noise may cause marine mammals to leave a habitat, impair their ability to communicate, or to cause stress. Noise can cause behavioral disturbances, mask other sounds including their own vocalizations, may result in injury, and, in some cases, may result in behaviors that ultimately lead to death. The severity of these impacts can vary greatly between minor impacts that have no real cost to the animal, to more severe impacts that may have lasting consequences.

Because responses to anthropogenic noise vary among species and individuals within species, it is difficult to determine long-term effects. Habitat abandonment due to anthropogenic noise exposure has been found in terrestrial species (Francis and Barber 2013). Clark et al. (2009) identified increasing levels of anthropogenic noise as a habitat concern for whales because of its potential effect on their ability to communicate (i.e., masking). Some research (McDonald et al. 2006; Parks 2003; Parks 2009) suggests marine mammals compensate for masking by changing the frequency, source level, redundancy, and timing of their calls. However, the long-term implications of these adjustments, if any, are currently unknown.

## 5.6 Other Arctic Projects

In the winters of 2014, 2017, and 2018, the U.S. Navy conducted submarine training, testing, and other research activities in the northern Beaufort Sea and Arctic Ocean from a temporary camp constructed on an ice flow toward the northern extent of the U.S. EEZ, about 185 to 370 km (115 to 230 mi) north of Prudhoe Bay. Equipment, materials, and personnel were transported to and from the ice camp via daily flights based out of the Deadhorse Airport (located in Prudhoe Bay). No takes were expected, nor authorized, for this activity.

In 2016, NMFS Alaska Region conducted internal consultations with NMFS Permits Division on the issuance of three Incidental Harassment Authorizations (IHA) to take marine mammals incidental to dock construction and anchor retrieval in the Bering, Chukchi, and Beaufort Seas during the 2016 open water season. The incidental take statements issued with the three biological opinions allowed for takes (by harassment) of 706 bearded seals and 7,887 ringed seals as a result of exposure to continuous or impulsive sounds at received levels at or above 120 dB or 160 dB re 1 μPa rms, respectively.

In 2016 and 2017, NMFS Alaska Region conducted internal consultations with NMFS Permits Division on the issuance of an IHA associated with the continuation of fiber optic cable laying. Quintillion was permitted to install 1,904 km (1,183 mi) of subsea fiber optic cable during the open-water season, including a main trunk line and six branch lines to onshore facilities in Nome, Kotzebue, Point Hope, Wainwright, Barrow, and Oliktok Point. The incidental take statements issued with the two biological opinions allowed for takes (by harassment) of 62 bearded seals and 855 ringed seals as a result of exposure to sounds of received levels at or above 120 dB re 1 $\mu Pa_{rms}$ from sea plows, anchor handling, and operation and maintenance activities (NMFS 2016b).

## 5.7 Scientific Research

NMFS issues scientific research permits that are valid for five years for ESA-listed species. When permits expire, researchers often apply for a new permit to continue their research. Additionally, applications for new permits are issued on an on-going basis; therefore, the number of active research permits is subject to change in the period during which this Opinion is valid.

Species considered in this Opinion also occur in Canadian waters. Although we do not have specific information about any permitted research activities in Canadian waters, we assume they will be similar to those described below.

Species considered in this Opinion are also taken incidentally during research directed towards other species. This includes various hydroacoustic surveys for fish species, the Alaska longline survey, the Arctic ecosystem integrated survey, and other research (NMFS 2019b).

*Cetaceans*
Whales are exposed to research activities documenting their biology, behavior, habitat use, stock structure, social organization, communication, distribution, and movements throughout their ranges. Activities associated with these permits occur in the action area, in some cases at the same time as the proposed project activities.

Currently permitted research activities include:

- Counting/surveying, aerial and vessel-based
- Opportunistic collection of sloughed skin and remains
- Behavioral and monitoring observations
- Various types of photography and videography
- Skin and blubber biopsy sampling
- Fecal sampling
- Suction-cup, dart/barb, satellite, and dorsal fin/ridge tagging
- Acoustic, active playback/broadcast, and passive recording
- Acoustic sonar for prey mapping

Some of these research activities require close vessel approach. The permits also include incidental harassment takes to cover such activities as tagging, where the research vessel may come within 100 yards of other whales while in pursuit of a target whale. These activities may cause stress to individual whales and cause behavioral responses. In some cases, take could occur and is authorized.

*Pinnipeds*
Steller sea lions, ringed seals, and bearded seals are exposed to research activities documenting their population status and trends, health, movements, habitat use, foraging ecology, response to recovery activities, distribution, and movements throughout their ranges.

Of the more than 30 active scientific research permits, some include behavioral observations, counting/surveying, photo-identification, and capture and restraint (by hand, net, cage, or board), for the purposes of performing the following procedures:

Collection of:

- Blood
- Clipped hair
- Urine and feces
- Nasal and oral swabs

- Vibrissae (pulled)
- Skin, blubber, or muscle biopsies
- Weight and body measurements
- Injection of sedative
- Administration of drugs (intramuscular, subcutaneous, or topical)
- Attachment of instruments to hair or flippers, including flipper tagging
- Ultrasound

# 6. EFFECTS OF THE ACTION

"Effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

This biological opinion relies on the best scientific and commercial information available. We try to note areas of uncertainty, or situations where data is not available. In analyzing the effects of the action, NMFS gives the benefit of the doubt to the listed species by minimizing the likelihood of false negative conclusions (concluding that adverse effects are not likely when such effects are, in fact, likely to occur).

We organize our effects analysis using a stressor identification – exposure – response – risk assessment framework for the proposed activities.

We conclude this section with an *Integration and Synthesis of Effects* that integrates information presented in the *Status of the Species* and *Environmental Baseline* sections of this opinion with the results of our exposure and response analyses to estimate the probable risks the proposed action poses to endangered and threatened species.

## 6.1 Project Stressors

Based on our review of the available data, the proposed action may cause the primary stressors identified below.

A) Pollution from unauthorized small spills
B) Seawater Treatment Facility
   - Disturbance of seals associated with building and operating a desalination plant

C) Vibroseis Surveys
   - Vehicle traffic impacts on ringed seals and their lairs

D) Marine Transit Route (MTR)
   - Vessels striking large whales

E) Barge Landing Area
   - Disturbance of seals due to construction activities

F) Acoustic Disturbances

- Aircraft: helicopters and airplanes
- Vessels
- Vibroseis equipment

**Table 4. Pinniped species and analyzed effects.**

| Action | Effect | Ringed Seal | Bearded Seal | Steller Sea Lion |
|---|---|---|---|---|
| Aircraft noise | Acoustic disturbance | ✓ | ✓ | |
| Small spill pollution | Contamination | ✓ | ✓ | ✓ |
| Seawater treatment facility | Acoustic disturbance | ✓ | ✓ | |
| Vibroseis survey | Acoustic disturbance | ✓ | ✓ | |
| Vibroseis survey | Harassment/harm due to vehicles | ✓ | ✓ | |
| Marine transit route | Ship strikes | ✓ | ✓ | ✓ |
| Marine transit route | Acoustic disturbance | ✓ | ✓ | ✓ |
| Barge landing area | Construction | ✓ | ✓ | |

**Table 5. Cetacean species and analyzed effects.**

| Action | Effect | Humpback Whale | Bowhead Whale | Fin Whale | N.P. Right Whale | Sperm Whale | Blue Whale |
|---|---|---|---|---|---|---|---|
| Aircraft noise | Acoustic disturbance | | ✓ | | | | |
| Small spill pollution | Contamination | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Seawater treatment facility | Acoustic disturbance | | | | | | |
| Vibroseis survey | Acoustic disturbance | | | | | | |
| Vibroseis survey | Harassment / harm due to vehicles | | | | | | |
| Marine transit route | Ship strikes | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Marine transit route | Acoustic disturbance | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Barge landing | Construction | | | | | | |

The following sections analyze the stressors likely to adversely affect ESA-listed species including the MTR, development of the seawater treatment plant, and vibroseis surveys. Acoustic disturbances associated with the stressors are discussed in Section 6.1.2.1; other anthropogenic disturbances are as follows:

### 6.1.1 Pollution from unauthorized spills

*Accidental Spills and Discharges*
Spilled materials include both crude oil and refined oil products used in equipment, marine vessels, etc. Materials could also include antifreeze (propylene and ethylene glycol), methanol, water soluble chemicals, corrosion inhibitors, scale inhibitors, drag reducing agents, and biocides. Small spills (<500 barrels) are reasonably certain to occur. They are typically confined to an activity area, such as ice and gravel roads and pads associated with the inland central processing facility, where cleanup is easily accomplished (BLM 2019). Indirect effects include potential reductions in prey base or disturbance from spill response and cleanup activities.

Due to the lease stipulations and required operating procedures, continually improving industry operating practices, and advancements in the best available control technology, the likelihood of a spill as well as spill size has been greatly diminished (BLM 2004). The Proposed Action also stipulates that any wells or central processing facility placed within 2 miles of any of marine waters, islands, or coastlines administered by BLM in the Coastal Plain will require lessees to develop and implement an impact and conflict avoidance and monitoring plan to assess, minimize, and mitigate the effects of the infrastructure and its use on these coastal habitats and their use by wildlife. BLM assumes for its hypothetical field in its analysis that the central processing facility will be 30 miles inland. Due to those restrictions, a small refined petroleum spill from barging, refueling, and from other activities associated with bringing in supplies (vehicle leaks, storage containers, equipment, etc.) is the most likely way oil could reach the marine environment in the Coastal Plain as well as along the MTR. These spills are generally low volume, containable, and easily cleaned. If the lease sale activity leads to exploration or production wells, it is possible that a large scale well blowout or other accident could lead to some amount of oil making its way to marine waters such that listed species could be exposed. We expect that would be a very low probability event.

Barging operations that support onshore exploration, such as vessel refueling, is the most likely way a small spill could occur. These types of spills involve relatively low volumes of refined oil products that would most likely volatize or weather away within hours to a couple days if they could not be contained or recovered. The density of marine mammals in waters off of the Coastal Plain portion of the action area during open water season, when barge refueling would occur, is low such that even if small quantities of refined oil products spill into marine water, there is a low probability that marine mammals would contact the spilled substance and be adversely effected (BLM 2019).

On-land spills could affect marine mammals during the summer when surface sheet flow, rivers, and streams could transport contaminants into the marine system. Spills under pressure can spray into the air and may be distributed downwind over substantial areas, affecting the water bodies. During the fall, spilled material can be dispersed when it reaches flowing water, but slowed or stopped when it reaches snow or surface ice. In the winter, spills to rivers and creeks generally would be restricted in distribution by the snow and ice covering the water body. Spills under the ice to creeks and rivers might disperse slowly because the currents are slow to nonexistent in the winter. During the spring, spills to waterbodies during breakup are likely to be widely dispersed and difficult to contain. Lessees will be required to develop and implement an impact and conflict avoidance and monitoring plan to assess, minimize, and mitigate the effects of the central processing facility, where the majority of the spills are most likely to occur, on the coastal habitats and their use by wildlife for operations occurring within 2 miles of the coast. The graphic supplied by BLM shows the central processing facility location as over 30 miles inland. Therefore the likelihood of a spill reaching the coastal and marine environment and impacting listed species under NMFS jurisdiction is very low.

While marine mammals may show irritation, annoyance, or distress from oil, for the most part, an animal's need to remain in an area for food, shelter, or other biological requirements overrides any avoidance behaviors to oil (Vos et al. 2003) increasing the animals' risk of exposure.

Animals can be affected outside of a main spill area through oil transported by currents and oiled prey. The exposure to oil needs to be in sufficient quantity to produce adverse effects from either external oiling, internal absorption from ingestion of oil and prey, aspiration of oil, inhalation of volatile vapors in the air, and/or a combination of the above. The primary potential effects to marine mammals from accidental oil spills include: 1) fouling of individuals (most notably their fur or baleen), 2) ingestion of oil or contaminated prey, 3) inhalation of petroleum vapors, 4) habitat/prey degradation, and 5) disruption of migration. Disruption of other essential behaviors, such as breeding, communication, and feeding, may also occur (BOEM 2017).

*Pinnipeds*

Should seals come into contact with spilled oil, they may experience a range of effects, from temporary behavioral impacts to injury and death (Geraci 2012). Seals can potentially ingest spilled product while feeding, inhale their volatile components, or experience problems from direct contact. Exposure to fresh oil may result in the inhalation of volatile fractions of the oil, with possible injury to the lungs and central nervous system. Surface contact with petroleum hydrocarbons, particularly the low-molecular-weight fractions, to seals can cause temporary damage of the mucous membranes and eyes (Davis et al. 1960) or epidermis (Walsh et al. 1974, Hansen 1985, Geraci and St. Aubin 1990). Contact with crude oil can damage eyes (Davis et al. 1960), resulting in corneal ulcers and abrasions, conjunctivitis, and swollen nictitating membranes (Geraci and Smith 1976a, Geraci and Smith 1976b). Crude oil immersion studies resulted in 100 percent mortality in captive ringed seals (Geraci and Smith 1976b). Unlike the animals in the immersion study, seals in the wild would have ice as a resting/escape platform or, during the open water period, water depth and distance for escape routes from an oil spill, which they might detect and avoid (Geraci and St. Aubin 1990).

Researchers have suggested that pups of ice-associated seals may be particularly vulnerable to fouling of their dense lanugo coat (Geraci and St. Aubin 1990, Jenssen 1996). Though bearded seal pups exhibit some prenatal molting, they are generally not fully molted at birth, and thus would be particularly prone to physical impacts of contacting oil. Adults, juveniles, and weaned young of the year rely on blubber for insulation, so effects on their thermoregulation are expected to be minimal since they are not as reliant on their coats for insulation. However, due to an acute sense of smell and good vision, both ringed and bearded seals likely could detect and avoid spills on the water's surface (St. Aubin 1990). Further, bearded seals can depurate some hydrocarbons from their bodies (BLM 2019).

A small oil spill would be localized and would not permanently affect fish and invertebrate populations that are ringed and bearded seal prey. The amount of fish and other prey lost in such a spill likely would be undetectable compared to what is broadly available throughout the range of the two seal species, which both forage over large areas of the Beaufort Sea and do not rely on local prey abundance (NMFS 2018b).

The effects of pollution from unauthorized spills on ringed and bearded seals are expected to be minor because the low volume of the spill, which if it cannot be cleaned up would dissipate to unharmful concentrations within hours to a couple days, thus reducing exposure of seals to the contaminant. The impact of accidental spills is very minor and thus, adverse effects to ringed and bearded seals will be immeasurably small (i.e., effects are too small to measure or detect).

Steller sea lions could experience inhalation and respiratory distress from hydrocarbon vapors or ingest the spill directly or indirectly by consuming contaminated prey or cleaning themselves. It may also cause skin and conjunctive tissue irritation. In addition, a small spill could contaminate prey for Steller sea lions, but would be limited to potential spills along the MTR (relative to the foraging areas broadly available throughout the range of Steller sea lions). Contamination would also be temporary. A small spill of refined oil less than 3 barrels is anticipated to evaporate and disperse within 24 hours; a 200 barrel refined oil spill is anticipated to evaporate and disperse within 3 days (NMFS 2018b). Small spills dissipate quickly, and thus we expect any impact of an accidental spill associated with this action in the MTR to be very minor, and thus adverse effects to Steller sea lions will be immeasurably small.

<u>*Cetaceans*</u>

A small spill (<500 barrels) could occur from vessels transiting in the MTR, as a result of oil exploration and development activities along the coast, or other spills near the coast or adjacent to streams. Individual whales or their prey could come into contact with oil. However, the ensuing effects would most likely be sub-lethal. If an individual whale came in direct contact with spilled oil in offshore waters it could experience inhalation and respiratory distress from hydrocarbon vapors, and less likely skin and conjunctive tissue irritation. Substantial injury and mortality due to physical contact inhalation and ingestion is possible; however, this is not likely in the MTR or in waters off of the Coastal Plain coastline due to the small spill size, rapid dispersion, and evaporation, as well as the propensity for oil to not adhere to cetacean skin (BOEM 2017, BLM 2019). Depending on the spill location and timing, a small refined spill in offshore waters could evaporate and disperse in 24-36 hours (BOEM 2017).

A small fuel spill would be localized and would not permanently affect whale prey populations (e.g., forage fish and zooplankton). The amount of zooplankton and other prey lost in such a spill would likely be undetectable compared to what is available on the whales' summer feeding grounds (BOEM 2017). NMFS does not expect small spills of refined fuels at the rates predicted by BLM to expose whales or their prey to a measureable level of contamination.

Due to the fast dissipation of a small spill and the low density of whales present in waters in the action area adjacent to the Coastal Plain, it is unlikely that injury or mortality would occur. The noise and human activity expected from a spill clean-up would also elicit avoidance behavior by whales, further reducing their exposure to the spill. Any small spill that happens in the MTR is expected to dissipate rapidly as well. Thus we expect any impact of an accidental spill associated with this action to be very minor and adverse effects to listed whales will be immeasurably small.

### 6.1.2 Seawater Treatment Facility

Please see Section 6.1.6 for acoustic disturbances associated with construction and operation of the seawater treatment facility.

It is unknown at this time whether a seawater treatment plant will be constructed. If it is, there are two scenarios: 1) the plant is built on the coastline and fresh water is piped inland to the central processing facility, or 2) the plant is built as part of the central processing facility and seawater is piped from the coast to its location inland. Building the seawater treatment plant on the coast could potentially affect ringed or bearded seals, whereas we would not expect such effects if it is built inland. The development would require approximately 15 acres of surface disturbance, in addition to a road and water transport pipeline to the central processing facility.

*Pinnipeds*

Construction would occur in the summer. Construction activities associated with building a seawater treatment plant on the coast may minimally impact ringed and bearded seals through harassment associated with construction noise, increased activity in the area, and increased air and vehicular traffic. In the spring, bearded seals are typically more abundant 20-100 nm from shore. They have been recorded nearly year-round at multiple locations in the Chukchi and Beaufort seas (Muto et al. 2019). In summer, they are rarely hauled out on land (Muto et al. 2019). Bearded seals prefer shear zones where drifting pack ice interacts with and grinds away fast ice (Burns and Frost 1979) and areas with open ice cover and water depths of 25-75 m (Stirling et al. 1977; Stirling et al. 1982). Their summer preferred habitat is characterized by shallow waters with flowing sea ice in depths less than 200 m (Stirling et al. 1982; Ivashin et al. 1972). It is unlikely that bearded seals will be impacted by runoff caused by construction or by operations of the plant because the seawater treatment plant is built on land, which is not habitat utilized by bearded seals. The impact of the seawater treatment plan is very minor, and thus adverse effects to bearded seals will be immeasurably small.

Because ringed seals very rarely come ashore during the summer (Muto et al. 2019) when the plant would be constructed, any impact of the seawater treatment plant construction on hauled-out ringed seals is unlikely, and if it occurs, is expected to be a very minor disturbance, and thus adverse effects to ringed seals will be immeasurably small.

*Cetaceans*

There are no anticipated impacts to cetaceans as this activity is land-based.

### 6.1.3 Vibroseis Surveys

*Pinnipeds*

**Ice roads and trails - Vehicle traffic on ringed seal lairs.** All heavy equipment and vehicles will be restricted to grounded ice with the exception of snow machines to set and retrieve recorders. Snow machine ice paths will not be greater than 3 feet wide on ungrounded ice.

A small number of ringed seals could be impacted by ice road construction, maintenance, and use, and the use of lesser developed trails over ice. Impact of tracked vehicles traveling over seal structures has not been accurately measures or studied (SAE 2018). Only three events of seals being directly impacted by vehicles have been recorded by industry on Alaska's North Slope since 1998 (BLM 2018). During only one of these was a ringed seal pup killed. Its lair was destroyed by a Caterpillar tractor clearing a road on ice over water 29 feet (9 m) deep with an ice thickness of 4.3 feet (1.3 m). Additionally, an adult may have been present when the lair was destroyed (MacLean 1998). However the other two incidents (April 24, 2018, and April 28, 2018) are not known to have resulted in death. In both cases, a seal pup climbed out a hole in the ice with no adult present (Hilcorp 2018; ENI 2018).

We adopt the calculations made by BLM (2019, Appendix 2) regarding the number of ringed seal pups potentially affected by vibroseis surveys. BLM assumed a uniform density of 1 seal lair per 964 acres in the Beaufort nearshore area, including the Arctic Refuge, across 39,270 acres of ungrounded ice. The estimate for area within which seals may be affected by vibroseis is based on the portion of waters to be seismically surveyed that are less than 10 feet deep. Data from Williams et al. (2001, 2002) indicates that there is 1 lair per 964 acres for a total of 40.74, or 41, lairs that can be found in ungrounded ice in the nearshore area where the lairs are subjected to potential crushing by on-ice vehicles; of this, 18 percent are birthing lairs (Frost and Burns 1989), or 7.33 birthing lairs.

Tucker tracked vehicles are expected to be used only on tundra and grounded ice, which are devoid of lairs. Snow machines, which pose reduced crushing hazard versus Tuckers, will be used over the nearshore areas. Ice paths from the snow machines will be on 660 foot intervals and 3 feet wide, with an additional buffer width of 25% added for maneuvering, totaling 400 acres (or 1 percent of the ungrounded ice) covered directly by vehicular footprints. This results in less than 1 (0.073) birthing lair that could potentially be under ice paths of the snow machines.

Pups have been observed to enter the water, dive to over 10 m, and return to the lair as early as 10 days after birth (BLM 2019). BLM used a conservative assumption that pups are unable to flee into the water for four weeks after birth, so a birthing lair has an immobile pup present approximately 50 percent of the time. However, BLM did not use this factor in their calculation. BLM anticipates, and NMFS agrees, that vibroseis surveys have the potential to be lethal on 0.041 seal pups (BLM 2019). Lethal take is unlikely to occur with the proposed action because all heavy equipment and vehicles will be restricted to grounded ice where lairs do not normally occur. Additionally, a snow machine's low level of downward pressure on snow is expected to greatly reduce potential impacts to over-driven seals and lairs relative to impacts due to a Tucker.

Surveys are expected to be completed by year four (Table 1). Thus no effects are expected by vibroseis surveys in years 5 through 85 associated with this leasing program.

Adaptive survey methods, such as using snow machines on ungrounded ice, would further reduce the mechanical footprint potential resulting in a lair collapse (BLM 2019). Additional factors that reduce the impacts of the potential crushing of a lair include the ability of an older pup or an adult to rapidly flush from a birthing lair, as well as project mitigation measures such as restricting ice use to grounded ice over less than 10 feet of water depth and delineation and marking of lairs when located (see Section 2.1.2 – subpart Additional Mitigation Measures). For these reasons, any potential impact of vibroseis surveys on ringed seal pups by lair crushing is very unlikely to occur, and we conclude that the adverse effects on ringed seals from vibroseis surveys through crushing of ringed seal pup lairs are improbable.

Bearded seals are not anticipated to be in the area during the timeframe during which the vibroseis surveys will be conducted and therefore are unlikely to be adversely impacted by these surveys. The vibroseis surveys will occur in March and April. During late winter and early spring, the Beaufort Sea coastline contains nearly continuous shorefast ice; the nearest lead system to the proposed survey is several kilometers away, making the area unsuitable habitat for bearded seals (BOEM 2017). Bearded seals therefore overwinter in the Bering Sea during the timing of the vibroseis surveys. Because of a lack of suitable habitat in the waters off of the Coastal Plain portion of the action area during the vibroseis surveys, impacts to bearded seals from harassment and harm associated with vibroseis surveys are extremely unlikely to occur. We conclude that the adverse effects associated with vibroseis surveys on bearded seals are improbable.

*Cetaceans*
There are no anticipated impacts to cetaceans as this activity is land-based.

### 6.1.4 Marine Transit Route (MTR)

Acoustic disturbance of vessel traffic is addressed in Section 6.1.6.

Marine vessel traffic can potentially pose a threat to pinnipeds and cetaceans in the action area, specifically along the MTR, because of ship strikes and vessel noise. In 2016-2017, there were more than 22,000 vessel arrivals to, and departures from, Dutch Harbor, Alaska (Figure 10; marinetraffic.com, accessed July 1, 2019). Vessel route densities off the Coastal Plain are about one to 16 routes over 2016-2017 (Figure 11). These include only commercial vessels with AIS tracking systems. The vessels may or may not include smaller fishing vessels and do not include skiffs. Vessel strikes of whales are a concern throughout the MTR given the increasing vessel traffic in Alaska.

NMFS assumed for this analysis that vessel traffic of two trips a year during exploration will continue through development (year 8). It will decrease to one trip annually during production, but then increase again to two trips annually during abandonment and reclamation (starting in year 19 through 85). Vessels will be used to bring large pieces of machinery to the central processing facility on the Coastal Plain, thus once the central processing facility is built, an airfield will replace much of the need for barges. One vessel trip annually during production is expected if large equipment fails and thus a barge is needed. Two vessel trips during abandonment and reclamation is expected for shipping large equipment from the area, although the assumption is that predominantly planes will be used until the airstrip itself is reclaimed.

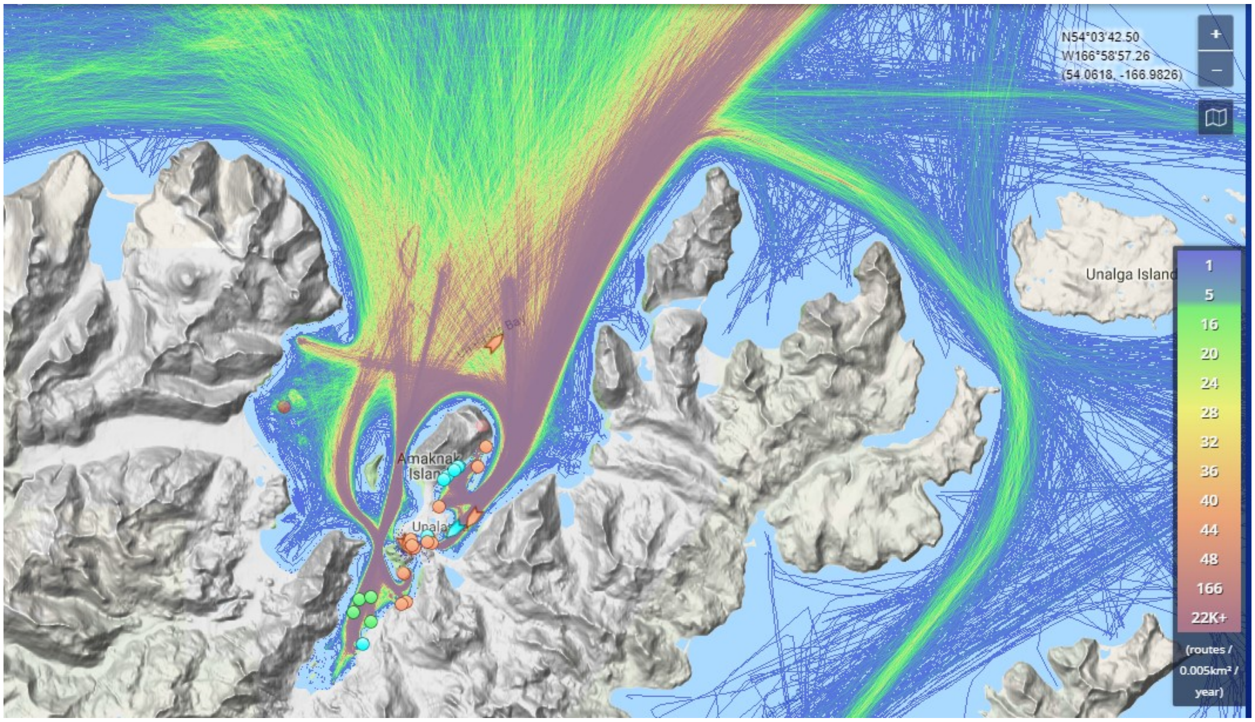


**Figure 10. 2016-2017 Marine traffic in and out of Dutch Harbor, Alaska.**

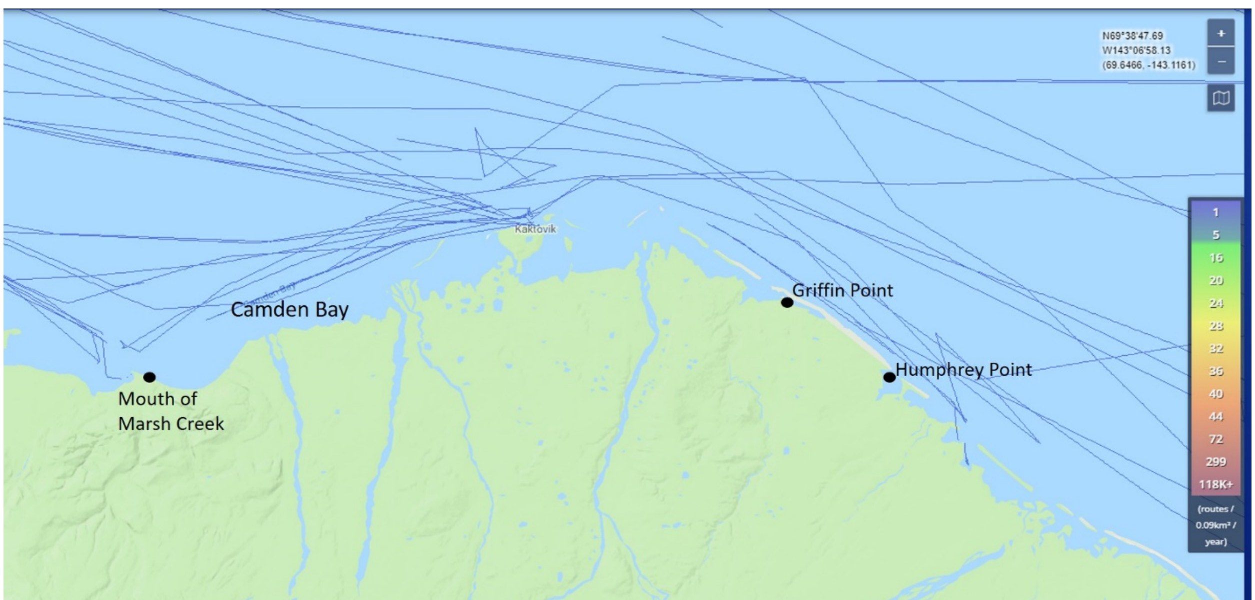


**Figure 11. 2016-2017 Vessel traffic near the proposed lease sale.**

*Pinnipeds*

Current shipping activities in the Arctic pose varying levels of threats to marine mammals, including ringed and bearded seals, depending on the type and intensity of the shipping activity and its degree of spatial and temporal overlap with their habitats. The presence and movements of ships in the vicinity of seals can affect their normal behavior (Jansen et al. 2010) and may cause them to abandon their preferred breeding habitats in areas with high traffic (Smiley and Milne 1979, Mansfield 1983). To date, no bearded or ringed seal carcasses have been found with propeller marks. However, Sternfeld (2004) documented a single spotted seal stranding in Bristol Bay, Alaska, that may have resulted from a propeller strike.

Vessels have the potential to disturb ringed or bearded seals hauled out on broken sea ice, but marine transportation for the proposed action is expected to occur during the open water season so such effects are unlikely. A ship strike of a seal is highly unlikely due to the maneuverability of seals and their general avoidance of ships. No ship strikes have been documented to date for either a bearded or ringed seal in the Action Area. The probability of a ship strike occurring is very small and thus adverse effects to bearded or ringed seals are extremely unlikely to occur.

Harassment of sea lions on haulouts or rookeries is also unlikely because mitigation measures require that vessels come no closer than three nautical miles from identified haulouts or rookeries (that are listed in regulation at 50 CFR 224.103(d)(1)(iii) & 50 CFR 226.202). Although risk of vessel strike has not been identified as a significant concern for Steller sea lions, the recovery plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated, e.g., near rookeries or haulouts (NMFS 2008c). In 2007, a Steller sea lion was found in Kachemak Bay that may have been struck by a watercraft. The Steller sea lion had two separate wounds consistent with blunt trauma (NMFS Alaska Regional Office Stranding Database accessed May 2019). For this action, no vessel strikes of Steller sea lions are anticipated. Despite all the vessel traffic around Dutch Harbor (Figure 10), there are no reported ship strikes of any Steller sea lions in this location or throughout the MTR (Helker et al. 2019; Muto et al. 2019). The probability of a ship strike occurring is very small and thus adverse effects to Steller sea lions are extremely unlikely to occur.

*Cetaceans*

Vessel strikes of humpback whales present a greater concern than for pinnipeds and most other whales. An examination of all known ship strikes for large (baleen and sperm) whales from all shipping sources indicates vessel speed is a principal factor in whether a vessel strike results in death (Laist et al. 2001; Vanderlaan and Taggart 2007). In assessing records with known vessel speeds, 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 24.1 km/hour (14.9 miles per hour; 13 knots), which is greater than the maximum speed for shipping vessels associated with this action.

There has been only one reported lethal take of a bowhead in the Arctic (not associated with subsistence harvest) from 2012-2016 and it was through entanglement with fishing gear (Helker et al. 2019). George et al. (2017) examined records for 904 bowhead whales harvested between 1990 and 2012. Of these, 505 whales were examined for scars from ship strikes, including propeller injuries. Only 10 whales harvested between 1990 and 2012 (approximately 2 percent of the total sample) showed clear evidence of scarring from ship propeller injuries. Assuming harvested whales are representative of the extant population, we can assume that 2% of bowheads encounter vessel strikes and survive to bear propeller scars or similar boat-induced injuries. However, given the low number of project-related vessel transits anticipated annually (two round trips of one barge and one tug), the mitigation measures associated with this action including reduced vessel speed, and the low number of documented ship strikes to date, the effects of ship strikes on bowhead whales is considered improbable.

There have been no documented injuries to sperm, blue, or North Pacific right whales by ship strike in waters off Alaska, and three documented injuries by ship strike from 2012-2016 of fin whales (one of which was in western Alaska) (Helker et al. 2019). Given the low number of transits anticipated annually (two), the mitigation measures associated with this action including reduced vessel speed, and the low number of documented ship strikes to date, ship strikes on sperm, blue, fin, and North Pacific right whales are very unlikely and thus we do not expect resulting effects.

Humpback whales are the most frequent victims of ship strikes in Alaska, accounting for 86 percent of all reported collisions (Neilson et al. 2012). Vessel strikes are a concern given the increasing humpback whale populations and increasing vessel traffic. Small vessel strikes were most common (<15 m, 60 percent), but medium (15–79 m, 27 percent) and large (≥80 m, 13 percent) vessels also struck humpback whales. Most strikes (91%) occurred in May through September, and there were no reports from December or January. The majority of strikes (76 percent) were reported in southeastern Alaska. From 2012 to 2016, 21 humpbacks incurred mortality or serious injury from vessel strikes (Helker et al. 2019). We have determined that the risk of project vessels striking humpback whales is extremely small for the following reasons: 1) there is no evidence of humpbacks having been struck by vessels north of Dutch Harbor, where the amount of traffic is relatively light; 2) this action includes vessel speed restrictions that are intended to further reduce the risk of vessels striking cetaceans; and 3) only a very small number of vessel transits associated with this action will occur each year (two round trips per year, each including one tug and one barge). Therefore, we conclude that the effects of this action on humpback whales due to vessel strikes is improbable.

### 6.1.5 Barge Landing Area

The construction of the barge landing site could disturb ringed or bearded seals. Barge landing sites are proposed for either the mouth of Marsh Creek in Camden Bay, or between Humphrey and Griffin Points (Figure 11). The barge landing and associated staging pad to store equipment and modules would disturb approximately 10 acres. The barge landing would likely utilize a floating industrial-strength modular-block plastic dock for support, as opposed to a fully constructed steel and wood dock. The barge landing area is expected to be used twice annually through year 8, then utilized only once annually at most.

Effects from the use of the barge landing site include unauthorized oil spills at the site and vessel strikes and vessel noise from vessels using the site. These effects are discussed under headings for pollution, marine transit route, and acoustic disturbance.

*Pinnipeds*

Dredging or screeding of the area, whether on Camden Bay near the mouth of Marsh Creek or farther east between Griffin and Humphrey Points, may affect ringed and bearded seals due to alteration of benthic foraging habitat at the barge landing site. The amount of dredging or screeding is dependent on the local bathymetry and placement of the landing. Due to the large amount of unaltered nearshore habitat available for ringed seal use compared to the small size of the dredged or screeded area (39,270 acres ungrounded ice associated with water less than 10 ft deep compared to 10 acres for the barge landing (BLM 2019)) and because the suspended sediment is expected to settle out or dissipate quickly due to wind and wave action (on the order of minutes to hours), the impact of the barge landing construction and use will be very minor, thus the adverse effects to ringed seals due to barge landing-associated effects will be immeasurably small.

Bearded seals' effective range is generally restricted to areas where seasonal sea ice occurs over relatively shallow waters. They generally prefer moving ice that produces natural openings and areas of open-water (Heptner et al. 1976, Fedoseev 1984, Nelson et al. 1984). Bearded seals usually avoid areas of continuous, thick, shorefast ice. Within the U.S. the extent of favorable ice conditions is most restricted in the Beaufort Sea, where there is a relatively narrow shelf with suitable water depths. The overall summer distribution is quite broad, with seals rarely hauled out on land (Heptner et al. 1976, Burns 1981, Nelson et al. 1984). During the open-water period the Beaufort Sea likely supports fewer bearded seals than the Chukchi Sea because of the more extensive foraging habitat on the continental shelf available to bearded seals there. The probability that the construction of the barge landing site will impact bearded seals is very low because bearded seals are rarely hauled out on land during the open water season, during which construction of the barge landing will occur. Their use of the surrounding waters that may be impacted during construction will be highly unlikely because suitable sea ice (for hauling out) will be unlikely, and if present, will preclude construction of the barge landing site. Adverse effects to bearded seals due to construction of the barge landing site are thus extremely unlikely to occur.

*Cetaceans*

There are no anticipated effects from construction of the barge landing area on cetaceans due to the site's proximity to shore and shallow depth where it is extremely unlikely cetaceans would be present.

### 6.1.6 Acoustic Disturbances

6.1.6.1 Acoustic Thresholds

As discussed in Section 2, *Description of the Proposed Action*, BLM intends to authorize vibroseis survey and other exploratory activities in the action area (Table 1).

Since 1997, NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater and in-air sounds that might result in impacts to marine mammals (70 FR 1871, 1872; January 11, 2005). NMFS recently developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary thresholds shifts (PTS and TTS; Level A harassment) (83 FR 28824; June 21, 2018). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels[5], expressed in root mean square[6] (rms), from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the MMPA:

- impulsive sound: 160 $dB_{rms}$ re 1 μPa

[5] Sound pressure is the sound force per unit micropascals (μPa), where 1 pascal (Pa) is the pressure resulting from a force of one newton exerted over an area of one square meter. Sound pressure level is expressed as the ratio of a measured sound pressure and a reference level. The commonly used reference pressure level in acoustics is 1 μPa, and the units for underwater sound pressure levels are decibels (dB) re 1 μPa.

[6] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

- continuous sound: 120 $dB_{rms}$ re 1µPa

Under the PTS Technical Guidance, NMFS uses the following thresholds for underwater sounds that cause injury (Table 6), referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (NMFS 2016c). These acoustic thresholds are presented using dual metrics of cumulative sound exposure level ($L_E$) and peak sound level (PK) for impulsive sounds and $L_E$ for non-impulsive sounds:

**Table 6. PTS Onset Acoustic Thresholds for Level A Harassment (NMFS 2016c).**

| | PTS Onset Acoustic Thresholds* (Received Level) | |
|---|---|---|
| **Hearing Group** | **Impulsive** | **Non-impulsive** |
| Low-Frequency (LF) Cetaceans | $L_{pk,flat}$: 219 dB<br>$L_{E,LF,24h}$: 183 dB | $L_{E,LF,24h}$: 199 dB |
| Mid-Frequency (MF) Cetaceans | $L_{pk,flat}$: 230 dB<br>$L_{E,MF,24h}$: 185 dB | $L_{E,MF,24h}$: 198 dB |
| High-Frequency (HF) Cetaceans | $L_{pk,flat}$: 202 dB<br>$L_{E,HF,24h}$: 155 dB | $L_{E,HF,24h}$: 173 dB |
| Phocid Pinnipeds (PW) (Underwater) | $L_{pk,flat}$: 218 dB<br>$L_{E,PW,24h}$: 185 dB | $L_{E,PW,24h}$: 201 dB |
| Otariid Pinnipeds (OW) (Underwater) | $L_{pk,flat}$: 232 dB<br>$L_{E,OW,24h}$: 203 dB | $L_{E,OW,24h}$: 219 dB |

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.
Note: Peak sound pressure ($L_{pk}$) has a reference value of 1 µPa, and cumulative sound exposure level ($L_E$) has a reference value of $1\mu Pa^2s$. The subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

In addition, NMFS uses the following thresholds for in-air sound pressure levels from broadband sounds that cause Level B behavioral disturbance under section 3(18)(A)(ii) of the MMPA:

- 100 dB re $20\mu Pa_{rms}$ for non-harbor seal pinnipeds

**Table 7. Sound frequency distributions of listed species and project-related activities**

| Activity | Minimum Sound Frequency | Maximum Sound Frequency |
|---|---|---|
| Vessel traffic | 5 Hz | 500 Hz |
| Aircraft | 60 Hz | 102 Hz |
| Vibroseis | 1.5 Hz | 96 Hz |
| **Species** | **Minimum Sound Frequency** | **Maximum Sound Frequency** |
| Bowhead whale* | 7 Hz | 35 kHz |
| Blue whale* | 7 Hz | 35 kHz |
| Fin whale | 20 Hz | 10 kHz |
| Gray whale* | 7 Hz | 35 kHz |
| Humpback whale* | 7 Hz | 35 kHz |
| North Pacific Right whale | 10 Hz | 22 kHz |
| Sperm whale* | 150 Hz | 160 kHz |
| Ringed seal* | 50 Hz | 86 kHz |
| Bearded seal* | 50 Hz | 86 kHz |
| Steller sea lion* | 60 Hz | 39 kHz |
| *Indicates using the applied frequency range for that type of species. Otherwise, the levels listed are from studies of that particular species. | | |

Natural physical noise originates from wind, waves at the surface, currents, earthquakes, ice movement, tidal currents, and atmospheric noise (Richardson et al. 1995). Biological noise includes sounds produced by marine mammals (particularly whales and dolphins, but also pinnipeds), fish (Maruska and Mensinger 2009), and invertebrates (Chitre et al. 2005).

Levels of anthropogenic sound vary in water depending on the season, type of activity, and local conditions. Anthropogenic noises in or near the sea that can contribute in any combination or alone to the total (ambient) noise at any one place and time include transportation, construction, petroleum exploration, seismic surveys, sonars, and ocean research activities (Richardson et al. 1995). Sources of anthropogenic sounds in the Beaufort and Chukchi Seas include aircraft and vessels, scientific and military equipment, oil and gas exploration and development, subsistence harvest activities and human settlements.

***Threshold Shifts.*** Acoustic exposures can result in two main forms of noise-induced losses in hearing sensitivity in marine mammals:

> **Permanent Threshold Shifts (PTS):** PTS is caused by physical damage to the sound receptors (hair cells) in the ear. Such damage produces permanent partial to total deafness within a range of audible noise frequencies.
>
> **Temporary Threshold Shifts (TTS):** TTS has been studied by determining the impact on sound receptors (hair cell damage). Because hair cell damage does not occur in a TTS, hearing losses are temporary, with recovery periods that can last minutes, days, or weeks. Its severity is dependent upon the duration, frequency, sound pressure, and rise time of a sound (Finneran and Schlundt 2013). Full recovery is expected, and this condition is not considered a physical injury.

The effect of noise exposure generally depends on a number of factors relating to the physical and spectral characteristics of the sound (e.g., the intensity, peak pressure, frequency, duration, duty cycle), and relating to the animal under consideration (e.g., hearing sensitivity, age, gender, behavioral status, prior exposures). Both TTS and PTS can result from a single pulse or from accumulated effects of multiple pulses from an impulsive sound source (i.e., impact pile or pipe driving) or from accumulated effects of non-pulsed sound from a continuous sound source (i.e., vibratory pile driving). In the case of exposure to multiple pulses, each pulse need not be as loud as a single pulse to have the same accumulated effect.

As it is a permanent auditory injury, the onset of PTS may be considered an example of "Level A harassment" as defined in the MMPA. TTS is by definition recoverable rather than permanent, and is treated as "Level B harassment" under the MMPA. Behavioral effects may also constitute Level B harassment, and are expected to occur at even lower noise levels than would generate TTS.

***Behavioral response.*** Behavioral response and disruption can occur as a result of anthropogenic noise effects. For example, animals could be disturbed from feeding or retreat or change course as a result of a sound source. Additional indicators of disturbance could be a change in speed, dive or surfacing duration, and respiration rates. Reaction of an animal to noise can depend on species, past exposure, habituation, age, health and gender of the individual, current activity, reproductive state, time of day, and other factors (Ellison et al. 2012, Erbe 2011). This is reflected in a variety of aquatic, aerial, and terrestrial animal responses to anthropogenic noise that may ultimately have fitness consequences (Francis and Barber 2013).

NMFS expects the majority of ESA-listed species responses to the proposed activities will occur in the form of behavioral response. Marine mammals may exhibit a variety of behavioral changes in response to underwater sound and the general presence of project activities and equipment, which can be generally summarized as:

- Modifying or stopping vocalizations
- Changing from one behavioral state to another
- Movement out of feeding, breeding, or migratory areas

The response of a marine mammal to an anthropogenic sound will depend on the frequency, 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 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). For marine mammals, a review of responses to anthropogenic sound was first conducted by Richardson et al. (1995). More recent reviews (e.g., Nowacek et al. 2007, Southall et al. 2007, Southall et al. 2009, Ellison et al. 2012) focus on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated.

Except for some vocalization changes that may be compensating for auditory masking, all behavioral reactions are assumed to occur due to a preceding stress or cueing response; however, stress responses cannot be predicted directly due to a lack of scientific data (see following section). Responses can overlap; for example, an increased respiration rate is likely to be coupled with a flight response. Differential responses are expected among and within species since hearing ranges vary across species and individuals, the behavioral ecology of individual species is unlikely to completely overlap, and individuals of the same species may react differently to the same, or similar, stressor.

***Masking.*** When noise interferes with sounds used by marine mammals (e.g., interferes with their communication or echolocation), it is said to "mask" the sound (a call to another whale might be masked by a vessel operating nearby). Masking occurs when sounds in the environment are louder than, and of a similar frequency to, auditory signals an animal is trying to receive. Noises can cause the masking of sounds that marine mammals need to hear to function (Erbe et al. 1999). Masking can impact communication (the transmission and reception of signals) by interfering with social signals, echolocation, predator and prey sounds, and environmental sounds (Erbe 2011). In the presence of the masking sounds, an animal's ability to detect and to discern the information in the sound is decreased.

Critical ratios, a measure of the relative ability of an animal to extract signals from noise, have been determined for pinnipeds (Southall et al. 2000, 2003) and bottlenose dolphins (Johnson 1967). These studies provide baseline information from which the probability of masking can be estimated.

Clark et al. (2009) developed a methodology for estimating masking effects on communication signals for low frequency cetaceans, including calculating the cumulative impact of multiple noise sources. For example, their technique calculates that in Stellwagen Bank National Marine Sanctuary, when two commercial vessels pass through a North Atlantic right whale's optimal communication space (estimated as a sphere of water with a diameter of 20 km), that space is decreased by 84 percent. This methodology relies on empirical data on source levels of calls (which is unknown for many species), and requires many assumptions about ambient noise conditions and simplifications of animal behavior. However, it is an important step in determining the impact of anthropogenic noise on animal communication. Subsequent research for the same species and location estimated that an average of 63 to 67 percent of North Atlantic right whale's communication space has been reduced by an increase in ambient noise levels, and that noise associated with transiting vessels is a major contributor to the increase in ambient noise (Hatch et al. 2012).

Vocal changes in response to anthropogenic noise can occur across sounds produced by marine mammals, such as whistling, echolocation click production, calling, and singing. Changes to vocal behavior and call structure may result from a need to compensate for an increase in background noise. In cetaceans, vocalization changes have been reported from exposure to anthropogenic noise sources such as sonar, vessel noise, and seismic surveying. Vocalizations may also change in response to variation in the natural acoustic environment (e.g., from variation in sea surface motion (Dunlop et al. 2014)).

***Non auditory physiological effects.*** Physiological stress or injury is an example of an effect from anthropogenic noise. Stress could be the direct result of noise or an indirect result such as stress caused by masking. Individuals exposed to noise can experience stress and distress, where stress is an adaptive response that does not normally place an animal at risk, and distress is a stress response resulting in a biological consequence to the individual. Both stress and distress can affect survival and productivity (Curry and Edwards 1998, Cowan and Curry 2002, Herráez et al. 2007, Cowan and Curry 2008). Mammalian stress levels can vary by age, sex, season, and health status (St. Aubin et al. 1996, Gardiner and Hall 1997, Hunt et al. 2006, Romero et al. 2008).

Anthropogenic activities have the potential to provide additional stressors above and beyond those that occur naturally. For example, various efforts have investigated the impact of vessels on marine mammals (both whale-watching and general vessel traffic noise) and demonstrated that impacts do occur (Erbe 2002, Williams et al. 2002, Williams and Ashe 2006, Williams and Noren 2009, Pirotta et al. 2015). In an analysis of energy costs to killer whales, Williams and Noren (2009) suggested that whale-watching in the Johnstone Strait resulted in lost feeding opportunities due to vessel disturbance. During the time following September 11, 2001, shipping traffic and associated ocean noise decreased along the northeastern U.S. This decrease in ocean noise was associated with a significant decline in fecal stress hormones in North Atlantic right whales, suggesting that chronic exposure to increased noise levels, although not acutely injurious, can produce stress (Rolland et al. 2012). These levels returned to their previous level within 24 hrs after the resumption of shipping traffic. Exposure to loud noise can also adversely affect reproductive and metabolic physiology (Kight and Swaddle 2011). In a variety of factors, including behavioral and physiological responses, females appear to be more sensitive or respond more strongly than males (Kight and Swaddle 2011).

If a sound is detected by a marine mammal, a stress response (e.g., startle or annoyance) or a cueing response (based on a past stressful experience) can occur. Although preliminary because of the small numbers of samples collected, different types of sounds have been shown to produce variable stress responses in marine mammals. Belugas demonstrated no catecholamine (hormones released in situations of stress) response to the playback of oil drilling sounds (Thomas et al. 1990) but showed an increase in catecholamines following exposure to impulsive sounds produced from a seismic water gun (Romano et al. 2004).

Whales and Steller sea lions use hearing as a primary way to gather information about their environment and for communication; therefore, we assume that limiting these abilities is stressful. Stress responses may also occur at levels lower than those required for TTS (Southall et al. 2007). Therefore, exposure to levels sufficient to trigger onset of PTS or TTS are expected to be accompanied by physiological stress responses (NRC 2003).

6.1.6.2 Vessel Noise

Vessel noise from commercial shipping traffic is a major source of low frequency (5 to 500 Hz) sound (Simmonds and Hutchinson 1996 in BLM 2019). The types of vessels in the MTR portion of the action area typically include commercial fishing boats, barges, skiffs with outboard motors, icebreakers, tourism and scientific research vessels, and vessels associated with oil and gas exploration, development, and production. The primary underwater noise associated with vessel operations due to this action is the continuous cavitation noise produced by the propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. Other noise sources include onboard diesel generators and the firing rate of the main engine, but both are subordinate to the blade rate harmonics (Gray and Greeley 1980). These continuous sounds for sea going barges have been measured at a peak sound source level of 170 dB re 1 μPa rms at 1 m (broadband), and they are emitted at dominant frequencies of less than 5 kHz, and generally less than 1 kHz (Miles et al. 1987, Richardson et al. 1995). Coastal barges and tugs produce a peak sound source level of approximately 164 dB re 1 µPa rms at 1 m (Richardson et al. 1995). Tugs pulling empty barges can produce source levels of 145 to 170 dB re 1 µPa-m (Richardson et al. 1995). The source level of approximately 170 dB at 1 meter are associated with oceanic tug boat noise and are anticipated to decline to 120 dB re 1µPa rms within 1.85 km (1.15 mi) of the source (Richardson et al. 1995). Crew boats and hovercraft are expected to have smaller peak sound source levels of approximately 156 dB re 1µPa rms at 1 m (Richardson et al. 1995) and 149 dB re 1µPa rms at 1 m (Blackwell and Greene 2005), respectively.

Vessel traffic and associated noise in the Chukchi and Beaufort seas presently is limited primarily to late spring, summer, and early autumn. Shipping sounds are often at source levels of 150–190 dB re 1 µPa at 1m (rms) (BOEMRE 2011). Shipping traffic is mostly at frequencies from 20–300 Hz (Greene 1995), which overlaps with the frequency distributions of all listed species along the MTR (Table 7). Zykov et al. (2008) observed that vessel sounds for barges, tugs, and support vessels at the Oooguruk Production Island were between 163 dB rms - 183 dB rms within 1 m (3 ft) from the source. This level of noise would not produce any injury to marine mammals, such as a TTS or PTS. However, marine mammals will likely move to avoid any approaching vessel. Vessel noise has the potential to disturb or temporarily displace marine mammals from preferred habitat along transit routes.

Numerous studies of interactions between surface vessels and marine mammals have demonstrated that free-ranging marine mammals engage in avoidance behavior when surface vessels move toward them. It is not clear whether these responses are caused by the physical presence of a surface vessel, the underwater noise generated by the vessel, or an interaction between the two (Goodwin and Cotton 2004, Lusseau 2006). However, several authors suggest that the noise generated during motion is probably an important factor (Evans et al. 1992, Blane and Jaakson 1994, Evans et al. 1994). These studies suggest that the behavioral responses of marine mammals to surface vessels are similar to their behavioral responses to predators.

Some marine mammals could receive sound levels in exceedance of the acoustic threshold of 120 dB from the vessels or be disturbed by their visual presence. However, NMFS has interpreted the term “harass” in the Interim Guidance on the ESA Term "Harass" (Wieting 2016) as to “create 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.” While listed marine mammals will likely be exposed to acoustic stressors from vessel transit, the nature of the exposure will be low-frequency, with much of the acoustic energy emitted by the vessels at frequencies below the best hearing ranges of the marine mammals expected to occur within the action area. In addition, because vessels will be in transit, the duration of the exposure will be very brief.

*Pinnipeds*

Ringed and Bearded Seals

Few authors have specifically described the responses of pinnipeds to boats, and most of the available information on reactions to boats concerns pinnipeds hauled out on land or ice. However, the mere presence and movements of ships in the vicinity of seals and sea lions can cause disturbance to their normal behaviors (Calkins and Pitcher 1982, Kucey 2005, Jansen et al. 2006). Disturbances from vessels may motivate seals and sea lions to leave haulout locations and enter the water (Kucey 2005), but they are expected to return to their normal activities when the vessel passes (BLM 2019).

Seals would be most affected by the vessels in the nearshore area of the Coastal Plain portion of the action area, especially as vessels approach and depart the barge landing site on the Beaufort Sea coast. Bearded seals may also be affected farther north into the MTR. Vessel traffic and its associated noise in the Chukchi and Beaufort seas is currently limited primarily to late spring, summer, and early autumn during ice free times. Ship traffic could elicit behavioral changes in bearded and ringed seals, mask their underwater communications, mask other sources of noise, and cause them to avoid noisy areas. Increases in ambient noise, however temporary, have the potential to mask communication between seals (Terhune et al. 1979) and some marine mammals have been known to alter their own signals to compensate for increased ambient noise levels (Evans 1982; Au et al. 1974; Di Lorio and Clark 2010; Parks et al. 2011), incurring energetic costs in the process.

In the Coastal Plain portion of the action area, pre-existing levels of vessel activity have not been shown to adversely affect seals (BLM 2019) and this action only proposes one to two transits annually. During open water surveys in the Beaufort and Chukchi Seas bearded and ringed seals showed only slight aversions to vessel activity (Harris et al. 2001; Blees et al. 2010; and Funk et al. 2010). Funk et al. (2010) noted among vessels operating in the Chukchi Sea where received sound levels were <120 dB, 40% of observed seals showed no response to a vessel's presence, slightly more than 40% swam away from the vessel, 5% swam towards the vessel, and the movements of 13% of the seals were unidentifiable. In the same Chukchi Sea surveys, 60% of the observed seals exhibited no reaction to vessels and 27% simply looked at the vessels. Funk et al. (2010) found that bearded seals were more likely to occur near the pack ice margin than in open water, and that it is likely some individuals near the vessel activity were likely displaced to some limited extent.

More recently, Bisson et al. (2013) reported on behavioral observations of seals during vessel-based monitoring of exploratory drilling activities by Shell in the Chukchi Sea during the 2012 open-water season. The majority of seals (42%) responded to moving vessels by looking at the vessel, while the second most identified behavior was no observable reaction (38%). The majority of seals (58%) showed no reaction to stationary vessels, while looking at the vessel was the second most common behavioral response (38%). Other common reactions to both moving and stationary vessels included splashing and changing direction. Richardson (1995) found vessel noise does not seem to strongly affect seals in the water, concluding that seals on haul outs often respond more strongly to the presence of vessels.

A small number of seals may encounter vessels associated with the proposed action. Green and Moore (1995) concluded that the effects of vessel traffic on seals are generally negligible to non-existent when they are in the water. Vessel traffic in the developed oil fields to the west of the Coastal Plain section of the action area has been operating in the nearshore environment for many years and have not been shown to adversely affect seals. As such, seals are thought to have habituated to the anthropogenic activities or learned to avoid the area (BLM 2019). In addition, seals are expected to move away from the vessels (BLM 2019). At most, vessel noise would briefly interrupt a seal's behavior until the vessel moved away from the seal; however, such an effect would not disrupt the immediate or long-term behavior of the affected seal. Vessels have been using an established route for years in the central Beaufort Sea in an effort to minimize impacts to marine mammals (BLM 2019) and subsistence hunters, so few seals outside the transit corridor (proposed MTR) should be disturbed by vessels.

In summary, vessel traffic is not expected to significantly disrupt normal seal behavioral patterns (breeding, feeding, sheltering, resting, migrating, etc.). While a seal may be exposed to vessel noise in open water or hauled out on land or ice, the effects of the vessel noise are likely to be temporary and transient. A vessel under way will pass the seal(s), thus the disturbance is transitory in nature. A vessel coming to the barge landing will, after docking, turn off the propellers and engine, reducing noise in the environment. The seal(s) upon hearing vessel noise typically show limited responses, such as increased alertness, diving, moving from the vessel's path by up to several hundred feet, or ignoring the vessel. If hauled out, seals typically enter the water when approached by vessels. Seals may be disrupted from feeding or resting, but for only a short duration that the vessel noise is present. Thus, the effects of vessel presence on seals in open water or hauled out on land or ice would likely be temporary and transient. We expect the impact of vessel sound associated with this action to be very minor because:

1) vessel traffic associated with the proposed action will be subject to mitigation measures described in Section 2.1.2 that are designed to avoid or minimize adverse effects to seals;
2) there will be two or fewer transits of project-related vessels accessing the barge landing per year throughout the life of the project, with 2 or fewer transits from year 1 to 6, 0-1 transits per year expected between years 7-19, and 2 or fewer transits from years 19-85;
3) and previously documented behavioral reactions to vessels showed little to no reaction by seals to vessels, and any observed reactions were (are expected to be) temporary and transient.

Thus, adverse effects of vessel noise to ringed and bearded seals will be extremely minor and are not likely to significantly disrupt normal seal behavioral patterns. Therefore take of ringed and bearded seals is not likely to occur from vessel noise associated with the proposed action.

<u>Steller Sea Lions</u>

The possible impact of vessel disturbance on Steller sea lions has not been well studied, yet the response by sea lions to disturbance will likely depend on the season and life stage in the reproductive cycle (NMFS 2008c). Vessel disturbance could potentially cause Steller sea lions to abandon their preferred breeding habitats in areas with high traffic (Kenyon and Rice 1961).

Underwater and in-air noise are both caused by vessels. Increases in ambient noise, however temporary, have the potential to mask communication between sea lions, and affect their ability to detect predators (Richardson and Malme 1993, Weilgart 2007). Potential impacts to Steller sea lions from disturbances, such as anthropogenic noise produced by vessel activity, would generally occur at haul-outs and near rookeries, where in-air vessel noise could cause behavioral responses (avoidance of the sound source, spatial displacement from the immediate surrounding area, trampling, and abandonment of pups; Calkins and Pitcher 1982; Lewis 1987; Kucey 2005; all cited in NMFS 2008). Sea lions could also respond with temporary movements from the area as a result of anthropogenic disturbances (Kucey 2005). The response of sea lions to disturbance may vary both temporally and spatially among groups within an area, and may result in greater avoidance or tolerance of certain areas depending on the source of the disturbance (Suryan and

Harvey 1999, Gill et al. 2001 in Kucey and Trites 2006).

Steller sea lions communicate under water using clicks, growls, snorts, and bleats (Poulter 1968; cited in Richardson et al. 1995). Anthropogenic noise, such as noise from vessel traffic, could mask and/or reduce the effectiveness of sea lion communication. However, NMFS (2008) ranked disturbance by vessel traffic as a minor threat to the recovery of the Steller Sea lion population.

Frequently Steller sea lions are observed hauling out in areas experiencing a high level of vessel traffic and human activity, such as boat marinas and navigation buoys (Jeffries et al. 2000; FO Canada 2010). Dutch Harbor has heavy vessel traffic (>22,000 transits in 2016-2017), thus it is likely that Steller sea lions in that area are habituated to anthropogenic noise.

Vessels that approach rookeries and haulouts at slow speed, in a manner that allows sea lions to observe the approach, have less effects than vessels that appear suddenly and approach quickly (NMFS 2008c). Sea lions may become accustomed to repeated slow vessel approaches, resulting in minimal response. Although low levels of occasional disturbance may have little long-term effect, areas subjected to repeated disturbance may be permanently abandoned. Repeated disturbances that result in abandonment or reduced use of rookeries by lactating females could negatively affect body condition and survival of pups through interruption of normal nursing cycles (NMFS 2008c). Pups are the age-class most vulnerable to disturbance from vessel traffic (NMFS 2008c).

The primary underwater noise associated with barging operations for the proposed action is the continuous cavitation noise produced by the propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. Other noise sources include onboard diesel generators and the firing rate of the main engine, but both are subordinate to the blade rate harmonics (Gray and Greeley 1980). These continuous sounds for sea going barges have been measured at a peak sound source level of 170 dB re 1 μParms at 1 m source (broadband), and they are emitted at dominant frequencies of less than 5 kHz, and generally less than 1 kHz (Miles et al. 1987, Richardson et al. 1995a, Simmonds et al. 2004). Coastal barges and tugs produce a peak sound source level of approximately 164 dB re 1 μParms at 1 m (Richardson et al. 1995a). For the marine transit route, the source level of approximately 170 dB at 1 meter are associated with oceanic tug boat noise and are anticipated to decline to 120 dB re 1μPa rms within 1.85 km (1.15 mi) of the source (Richardson et al. 1995a).

Sea lions in the action area are more likely to respond to vessel noise when a vessel passes a haulout than when a vessel passes a sea lion in the water (NMFS 2019). However, the implementation of mitigation measures (Section 2.1.2), particularly vessels remaining more than 3 nm from major Steller sea lion rookeries and haulouts (listed in regulation at 50 CFR 224.103(d)(1)(iii) & 50 CFR 226.202), will make it unlikely that vessels associated with this action will disturb hauled-out Steller sea lions. The effects of vessel presence on sea lions in open water is likely to be temporary and transient in nature as the vessel approaches and passes sea lions.

Project vessel activity will result in a marginal increase in vessel noise in the MTR because there are only two proposed transits annually during exploration and development (through year 8), one transit expected annually during production, and then two transits annually during abandonment and reclamation, which may start as early as year 19 and extends to year 85. The impact of vessel noise is expected to be temporary and very minor, and thus adverse effects to western DPS Steller sea lions will be immeasurably small. Therefore adverse effects are not likely to significantly disrupt normal Steller sea lion behavioral patterns and take of western DPS Steller sea lions is not likely to occur from vessel noise associated with the proposed action.

*Cetaceans*

Bowhead whales

Vessel noise and presence can impact whales by causing behavioral disturbances, auditory interference, or non-auditory physical and physiological effects (e.g., vessel strike; Section 6.1.4). The distance, speed, and direction of vessel travel in relation to whales, the whales' sensitivity to the vessels, and the activities engaged in by the whales all contribute to the level of response of the whales to the vessels. Bowhead whales are among the more vocal of the baleen whales (Clark and Johnson 1984). They mainly communicate with low frequency sounds. Most underwater calls are at a fairly low frequency and easily audible to the human ear. Bowhead whales may use low-frequency sounds to obtain information about the ocean floor and locations of ice.

Based on a suite of studies of cetacean behavior to vessel approaches (Au and Perryman 1982, Hewitt 1985, Bauer and Herman 1986, Corkeron 1995, Bejder et al. 1999, Au and Green 2000, Nowacek et al. 2001, David 2002, Magalhaes et al. 2002, Ng and Leung 2003, Goodwin and Cotton 2004, Bain et al. 2006, Bejder et al. 2006, Lusseau 2006, Richter et al. 2006, Lusseau and Bejder 2007), the set of variables that help determine whether marine mammals are likely to be disturbed by surface vessels include 1) the number of vessels, 2) distance between the animal and the vessel, 3) vessel speed and vector, and 4) behavioral state of the animal(s). Most of the investigations reported that animals tended to reduce their visibility at the water's surface and move horizontally away from the source of disturbance or adopt erratic swimming strategies (Williams et al. 2002, Lusseau 2003, 2006). In the process, their dive times increased, vocalizations and jumping were reduced (with the exception of beaked whales), individuals in groups moved closer together, swimming speeds increased, and their direction of travel took them away from the source of disturbance (Kruse 1991, Evans et al. 1994). Some individuals also dove and remained motionless, waiting until the vessel moved past their location. Most animals finding themselves in confined spaces, such as shallow bays, during vessel approaches tended to move towards more open, deeper waters (Kruse 1991). We assume that this movement would give them greater opportunities to avoid or evade vessels as conditions warranted.

Bowhead whales use the nearshore waters off of the Coastal Plain part of the action area. Huntington (2013) reported that local whalers identify Camden Bay as an important feeding and resting area for bowhead whales. They are observed throughout Camden Bay from July, after the ice goes out, until September when the main fall migration arrives from the east. Bowhead whales are most abundant in Camden Bay during the fall migration when they often stay to feed for up to several weeks before continuing their migration (Huntington 2013). Local whalers have observed bowheads close to shore in Camden Bay and off the mouths of the Jago and Hulahula rivers where they assume food can be found (Huntington 2013). This proposed barge landing areas range from 13 to 38 miles from the mouths of the Jago and Hulahula rivers. Given that bowhead whales are on migration over extended distances, vessel traffic associated with the proposed barge landing areas may impact the whales (Figure 12).


**Figure 12. Coastal Plain area showing potential barge landing areas (Marsh Creek and Griffin to Humphrey Point), Kaktovik, and the Hulahula and Jago river mouths where bowheads are known to feed.**

Bowhead whale hearing sensitivity is thought to be greatest at lower frequencies (BLM 2019), which is where vessel noise is concentrated. Vessel noise could result in physical injury if a bowhead were exposed to sound source levels if they exceed TTS onset thresholds. However, such a scenario is unlikely because the TTS onset threshold for bowheads is 199 dB and vessels create sound levels of 190 dB or less, and because bowheads would be expected to detect and avoid areas where continuous sound exposure levels exceed tolerable limits (BLM 2019). Given those conditions, vessel noise and presence more likely would elicit short-term, behavioral responses.

According to Richardson and Malme (1993), most bowheads will swim away quickly in response to vessels that approach them rapidly and directly. Avoidance usually begins when the vessel is 1–4 km (0.6–2.5 mi) away. Vessels can also temporarily disrupt whale activity and social groups (Richardson and Malme 1993). Retreating from a vessel generally stopped within minutes after the vessel passed, but scattering of whales may persist (Koski and Johnson 1987), while some bowheads returned to their original locations (Richardson and Malme 1993). Bowheads often are more tolerant of vessels moving slowly or in directions other than toward the whales. Whale reactions to vessel presence was also reported by Bisson et al. (2013) where most whales exhibited no observable movement or neutral movement relative to moving vessels.

Multiple studies have reported that after disturbance and displacement by vessels, bowheads may return to a disturbed area within several days (e.g., Koski and Johnson 1987; Thomson and Richardson 1987). Other reactions can be more subtle, such as behavioral changes in their surfacing and blow cycles, while others appear to be unaffected. Further, bowheads actively engaged in social interactions or mating may be less responsive to vessels (MMS 2002).

Bowhead whales could encounter barge traffic along the MTR in the Bering, Chukchi, and Beaufort Seas once to twice annually during this action for the first eight years, once a year for years eight through 19, then twice again starting with decommissioning which could begin as early as year 19 and goes through year 85; there are several mitigation measures that will reduce potential impacts to bowhead whales from noise associated with vessels. The one to two transits consisting of one tug and barge a year are not expected to significantly increase the amount of sound in the environment, and the transits would be short in duration. Although some bowheads could receive sound levels in exceedance of the acoustic threshold of 120 dB from the tugs during this proposed project, take by harassment is unlikely to occur because the noise is not likely to significantly disrupt normal behavioral patterns (Wieting 2016). While bowheads will likely be exposed to acoustic stressors from this proposed project, the duration of the exposure will be temporary and of very short duration, because vessels will be in transit. At 10 knots, vessels will ensonify a given point in space to levels above 120 dB for less than 9 minutes. Because vessels will be emitting continuous sound as they transit through the area, vessel activities will alert bowheads of their presence before the received level of sound exceeds 120 dB (Level B take threshold). Therefore, a startle response is not expected. Rather deflection and avoidance are expected to be common responses in those instances where there is any response at all. The implementation of mitigation measures is expected to further reduce the significance of bowhead whale reaction to transiting vessels. While a few whales may be exposed to vessel noise, the effects are anticipated to be too small to detect or measure and are not likely to significantly disrupt normal bowhead whale behavioral patterns. We therefore conclude that take of bowhead whales is not likely to occur from vessel noise associated with the proposed action.

Humpback, fin, blue, sperm, and North Pacific right whales

Sub-arctic whales occurring in the MTR could be affected by vessel presence and noise in the same manner as previously described for the bowhead whale. The primary underwater noise associated with barging operations is the continuous cavitation noise produced by the propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. For the marine transit route, the source levels of approximately 170 dB at 1 meter are associated with oceanic tug boat noise and are anticipated to decline to 120 dB re 1μPa rms within 1.85 km (1.15 mi) of the source (Richardson et al. 1995a).

Masking is of special concern for baleen whales that vocalize at low frequencies over long distances, such as humpback and fin whales, as their communication frequencies overlap with anthropogenic sounds such as shipping traffic. Some baleen whales have adjusted their communication frequencies, intensity, and call rate to limit masking effects. For example, McDonald et al. (1995) found that blue whales (*Balaenoptera musculus*) in California shifted their call frequencies downward by 31 percent since the 1960s, possibly to communicate below shipping sound frequencies. Melcon et al. (2012) found blue whales to increase their call rates in the presence of typically low frequency shipping sound, but to significantly decrease call rates when exposed to mid-frequency sonar. Fin whales have reduced their calling rate in response to boat noise (Watkins 1986). Right whales have been observed changing vocal behavior due to distance shipping that has increased overall background noise (Parks et al. 2007).

Ship noise due to propeller cavitation can cause behavioral changes by baleen whales. Humpback whale reactions to approaching boats are variable, ranging from approach to avoidance (Payne 1978, Salden 1993). Baker et al. (1983) reported that humpbacks in Hawaii responded to vessels at distances of 2 to 4 km, however humpbacks showed no reaction at distances beyond 800 m when the whales were feeding (Watkins 1981, Kreiger and Wing 1986).

Humpback whales are especially responsive to fast moving vessels (Richardson et al. 1995) exhibiting aerial behaviors such as breaching or tail/flipper slapping (Jurasz and Jurasz 1979). However, temporarily disturbed whales often remain in the area despite the presence of vessels (Baker et al. 1988, Baker et al. 1992).

Bauer and Herman (1986) concluded that reactions to vessels are probably stressful to humpback whales, but that the biological significance of that stress is unknown. Humpback whales seem less likely to react to vessels when actively feeding than when resting or engaged in other activities (Kreiger and Wing 1986). Mothers with newborn calves seem most sensitive to vessel disturbance (Clapham and Mattila 1993). Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, which would imply that they incur an energy cost. Morete et al. (2007) reported that undisturbed humpback whale cows that were accompanied by their calves were frequently observed resting while their calves circled them (milling) and rolling interspersed with dives. When vessels approached, the amount of time cows and calves spent resting and milling declined significantly.

Fin whales responded to vessels at distances of about 1 km (Edds and MacFarlane 1987). Watkins (1981) found that fin and humpback whales appeared startled and increased their swimming speed to avoid approaching vessels. Jahoda et al. (2003) studied responses of fin whales in feeding areas when they were closely approached by inflatable vessels. The study concluded that close vessel approaches caused the fin whales to swim away from the approaching vessel and to stop feeding. These animals also had increases in blow rates and spent less time at the surface (Jahoda et al. 2003). This suggests increases in metabolic rates, which may indicate a stress response. All these responses can manifest as a stress response in which the mammal undergoes physiological changes with chronic exposure to stressors, and can interrupt behavioral and physiological events, alter time budget, or a combination of these stressors (Sapolsky 2000, Frid and Dill 2002).

Sperm whales did not do any foraging dives when approached closely by a seismic survey vessel emitting airgun noise, significantly reduced their fluke stroke effort during exposure to seismic noise compared to after the exposure, and reduced their fluke strokes on foraging dives in the presence of seismic noise (Weilgart 2007b). However, sperm whales in Norway had an apparent tolerance to seismic surveys (Madsen et al. 2006).

Although some whales could receive sound levels in exceedance of the acoustic threshold of 120 dB from the tugs during this proposed action, take by harassment is unlikely to occur because the noise is not likely to significantly disrupt normal behavioral patterns (Wieting 2016). While they will likely be exposed to acoustic stressors from this proposed action, the duration of the exposure will be temporary and of very short duration, because vessels will be in transit. At 10 knots, vessels will ensonify a given point in space to levels above 120 dB for less than 9 minutes. Project vessels will emit continuous sound while in transit, which will alert marine mammals before the received sound level exceeds 120 dB. Therefore, a startle response is not expected. Rather, slight deflection and avoidance are expected to be common responses in those instances where there is any response at all. The low number of transits expected annually in years one through 85 and the adherence to mitigation measures in Section 2.1.2 are expected to further reduce the potential for blue whales, North Pacific right whales, sperm whales, fin whales, or humpback whales to react discernibly to transiting vessels. We expect any effects to these species to be too small to detect or measure and that any effects would not significantly disrupt normal whale behavioral patterns. Therefore, we conclude that adverse effects to these species from vessel noise would not rise to the level of take.

In addition, based on the extremely low density of North Pacific right and sperm whales in the Bering Sea, and limited number of vessel transits associated with the project from years one through 85, we do not anticipate spatial overlap between these species and vessel operations. Thus, the probability of exposure to vessel noise at the level of harassment by transiting vessels is very small, and adverse effects to North Pacific right and sperm whales are extremely unlikely to occur. Therefore, we conclude that adverse effects from the vessel noise to North Pacific right and sperm whales are improbable.

6.1.6.3 Aircraft Sound

Potential effects of this action include noise generated by flights to the Coastal Plain. Aircraft, including fixed-wing airplanes and helicopters, may be used year round to bring supplies to the central processing facility. Lessees will be required to develop and implement an impact and conflict avoidance and monitoring plan to assess, minimize, and mitigate the effects of the infrastructure and its use on these coastal habitats and their use by wildlife for operations occurring within 2 miles from the coast. Based on the information provided by BLM, the central processing facility is expected to be built 30 miles inland.

Aircraft flying below 500 ft (152 m) have a higher likelihood of startling or affecting marine mammals than those flying above 500 ft. Most fixed-wing aircraft are capable of producing tones mostly in the 68-102 Hz range and in-water source levels up to 162 dB re 1 µPa-m (Greene and Moore 1995). Helicopters are generally audible in the water column for tens of seconds as they pass overhead. Marine mammal responses vary depending on flight altitude and received sound levels. Required operating procedure #34 and aircraft mitigation measures require that most aviation transit occur at 1500 ft or higher, except for safety reasons. Helicopters cannot hover or circle above or within 1500 ft of groups of marine mammals.

*Pinnipeds*

Previous studies in the Beaufort Sea have indicated that reactions of ringed seals to disturbance from anthropogenic activities are, at most, short-lived; the animals return to normal behavior patterns shortly after the aircraft (or other activity) has passed (Kelly et al. 1986; MMS 2002; Blackwell et al. 2004). Female ringed seals give birth to a single pup in their lairs during mid-March through April (Kelly et al. 2010a). Temporal overlap may occur between project-related flights and pupping; however, adults and pups in lairs will experience only highly attenuated aircraft sounds due to the acoustic properties of the snow and ice enclosing the lair. We do not expect any animals in lairs to seek escape from aircraft sounds by entering the water.

Ringed seals exposed on ice or land are likely to show greater responses to aircraft traffic than seals in the water. Ringed seals have noticeable flight reactions to helicopters (Born et al. 1999; Richardson 1995; Burns and Harbo 1972). Bearded seals prefer ice flows farther from land, thus the flight path for aircraft does not spatially overlap the expected location of bearded seals.

We do not expect harassment from airborne noise because of the mitigation measures in place to reduce airborne sound levels below the harassment threshold, and because the flights are generally expected to be from a point on land (e.g. Fairbanks, Anchorage) to the central processing facility on the Coastal Plain, which is anticipated by BLM to be 30 miles inland, instead of over water and the coast line. Should the central processing facility be built on the coast, lessees will develop and implement an impact and conflict avoidance and monitoring plan to assess, minimize, and mitigate the effects of the infrastructure and its use on these coastal habitats and their use by wildlife for operations occurring within 2 miles from the coast. Therefore, the impact of aircraft noise is expected to be very minor, and thus any adverse effects to ringed and bearded seals will be immeasurably small.

Aircraft-related sound related to this project is not expected to affect Steller sea lions as aircraft associated with this project will not be operated near Steller sea lions, but only in the Coastal Plain portion of the action area. The probability of project-related aircraft sound occurring within hearing range of a Steller sea lion is very small, and thus adverse effects to Steller sea lions are extremely unlikely to occur.

*Cetaceans*
Project related flights will occur between facilities on shore (e.g. originating from Fairbanks or Anchorage going to the shore-based central processing facility). The effects of aircraft noise on bowhead or other whales are unlikely to occur because of the spatial separation between aircraft (avoiding flying over the coast or marine waters to land on an inland airstrip) and whales (occurring well offshore). Additionally, required operating procedure #34 and mitigation measures will further reduce the interaction between whales and aircraft. The impact of aircraft noise on bowhead or other whales is expected to be very minor and thus any adverse effects to cetaceans will be immeasurably small.

6.1.6.4 Vibroseis Surveys
Vibroseis surveys are seismic activities that could impact ringed seals by lair collapse due to vehicles driving over lairs, noise disturbance, vehicle presence, and on-ice travel. Non-noise impacts are discussed above in Section 6.1.3. Vibroseis source pressure waveforms are typically frequency sweeps below 100 Hz, although strong harmonics may exist to 1.5 kHz with signal durations of 5 to 20 seconds (NMFS 2018). Maximum in-water source levels have been recorded at 210 dB re 1 μPa at 1 m (Richardson et al. 1995), and diminish to ambient noise level at 3.5-5 km (Holliday et al. 1983). The in-air source level is anticipated to be 117 dB re 20μPa at 10 m and may be expected to decline to 100 dB re 20 μ within 12 m (BLM 2018). We anticipate similar propagation distances associated with the proposed action. However, a sound source verification study will be performed (Section 2.1.2 Additional Mitigation Measures 2) to confirm distances to harassment zones, and adjustments will be made to vibroseis operations accordingly (e.g., moved back from the open water and unground ice edge). Vibroseis surveys are expected to occur only during exploration, so will be concluded within the first four years after a lease sale.

*Pinnipeds*

In Water
Exposure to vibroseis program sounds could impact nearby seals while they are in the water column or while they are hauled out on the surface of the ice. Project-related activities could

potentially induce hauled-out ringed seals to depart from their lairs into the water. Possible results of this flushing could be increased energy expenditure from fleeing, increased stress levels, disruption of feeding, disruption of resting, and disruption of mating. Disruption of unweaned pups could result in hypothermia or separation of mother and pup. Anthropogenic sound in any area within or near the operation would be continuous until the operation moved through the area.

In an analysis of a vibroseis program that planned to operate in the entire nearshore habitat (approximately 71,400 acres of water less than 10 ft deep) of the Coastal Plain, BLM (2018) concluded and NMFS (2018a) concurred that disturbance of ringed seals from vibroseis activities would be improbable. Vibroseis operations are anticipated to have a frequency sweep of approximately 1.5 to 96 Hz with harmonics to 1.5 kHz. Ringed seals audiograms indicate they have very little hearing sensitivity below 1 kHz. Phocid functional hearing range is 50 Hz to 86 kHz (NMFS 2018). Thus, NMFS (2018a) concluded that this type of seismic project was not likely to expose ringed seals to in-water sound pressure levels that reach Level B acoustic thresholds because: 1) few ringed seals are expected to be present in the 10 feet or less of water where vibroseis operations will be conducted, and 2) the majority of acoustic energy associated with vibroseis operations is anticipated to occur at frequencies below ringed seal hearing sensitivity. In addition, a sound source verification study will be conducted for this action to determine the 120 dB buffer distance from open water and ungrounded ice for subsequent vibroseis operations, which minimizes the risk of exposure.

We anticipate similar levels of disturbance exposure throughout the Coastal Plain lease sale where in-water sound from seismic project-related activities would be unlikely to harm seals because sound would originate from within grounded ice away from seals. Additionally, distance buffers from ungrounded ice would ensure sound attenuated to below disturbance thresholds before reaching water. Lastly, mitigation measures will be implemented, including sound source verification studies to determine and implement the appropriate buffer distance from grounded to ungrounded ice or open water to ensure sound levels in water are below 120 dB re 1 µPa. The impact of in-water sound from this project's vibroseis surveys is expected to be very minor and thus, any adverse effects to ringed seals that would rise to the level of a take are unlikely.

<u>In Air</u>

The majority of the vibroseis work will occur in March and April. Seals are not usually present basking on the surface of the ice until May, and would not be subject to disturbance from airborne sound until this time if activities continued. Seals present on the ice will be avoided due to implementation of mitigation measures that limit the distance vibroseis operations can get to any basking seals (500 foot buffer; see Section 2.1.2.3, Measure 2: Nearshore Seismic Activities (vibroseis)).

Hauled-out ringed seals would typically be within lairs during a major portion of any seismic program, where the snow over the lair acting as an insulator from airborne sound would further reduce exposure. NMFS (2018a) concluded that no harassment from airborne noise was anticipated for a Coastal Plain seismic program because: 1) mitigation measures would be in place to reduce airborne sound levels below the harassment threshold, and 2) during the majority of operations, ringed seals would be within lairs, which are effective insulators from airborne sound.

Mitigation measures require that basking seals be avoided by a NMFS-approved distance set-backs. Using a combination of similar mitigation measures, timing and locations requirements, NMFS (2018a) did not anticipate that ringed seals would be exposed to project-related noise for a Coastal Plain seismic program. If exposure were to occur, mitigation measures would make exposure to sound levels in excess of Level B MMPA take thresholds extremely unlikely. We anticipate similar levels and types of potential harassment associated with on- ice activities as described by NMFS (2018a) to occur throughout the life of the proposed action. There is a low potential for ensonification-related impacts. If seals are exposed, it will be at low levels such that any effects likely will be too small to detect or measure.

No harassment is expected from airborne noise from the Coastal Plain seismic activities because 1) mitigation measures will be in place to reduce received levels of airborne sound below the harassment threshold, 2) ringed seals on ice are expected to flush into the water as a result of vehicle presence, which reduces exposure to airborne noise, and 3) ringed seals will be in their lairs during the majority of the activities, where they will be insulated from airborne noise. The impact of in-air sound from vibroseis surveys is very minor. Therefore we conclude that it is unlikely that any adverse effects to ringed seals from in-air sound from vibroseis surveys would rise to the level of a take.

*Bearded Seals*

Bearded seals are not anticipated to be in the area during the timeframe during which the surveys will be conducted and therefore are extremely unlikely to be adversely affected by vibroseis surveys. Most bearded seals overwinter in the Bering Sea, far from the area where vibroseis surveys would be conducted in the Beaufort Sea. During late winter and early spring, the Beaufort Sea coastline contains nearly continuous shorefast ice; the nearest lead system to the proposed survey is several kilometers away, making the area unsuitable habitat for bearded seals (BOEM 2017). The vibroseis surveys will occur in March and April. Most bearded seals are in the Bering Sea during the timing of the vibroseis surveys because of a lack of suitable habitat in the waters off of the Coastal Plain portion of the action area, therefore we conclude that the probability of acoustic harassment (in water and in air) associated with vibroseis surveys occurring is very small and thus, adverse effects to bearded seals are extremely unlikely to occur. Therefore we conclude that the adverse effects from acoustic harassment associated with vibroseis surveys on bearded seals are improbable.

*Cetaceans*

Vibroseis surveys are restricted to land and shorefast ice at a time of year when whales are not expected to be in the area (i.e., waters off of the Coastal Plain portion of the action area). Thus the probability of vibroseis surveys causing adverse effects to cetaceans is extremely unlikely to occur. Therefore we conclude that the adverse effects from vibroseis surveys on cetaceans are improbable.

## 6.2 Effects on Critical Habitat

### 6.2.1 North Pacific Right Whale Critical Habitat

A portion of the marine transit route crosses North Pacific right whale critical habitat. Prey resources (copepods) are an essential feature of critical habitat for right whales, and the habitat could be subject to an accidental release of oil. If a small spill were to occur originating from project vessels, we expect that the released product will evaporate and disperse quickly in offshore waters. Therefore, the impacts of a small oil spill is very minor, and adverse effects to North Pacific right whale critical habitat will be immeasurably small. The probability of a small oil spill occurring is very small, and thus adverse effects to North Pacific right whale critical habitat are extremely unlikely to occur. Therefore we conclude that the adverse effects from a small oil spill on North Pacific right whale critical habitat are inconsequential and improbable.

### 6.2.2 Steller Sea Lion Critical Habitat

Western DPS Steller sea lion critical habitat includes aquatic zones that extend 20 nm seaward from the baseline or basepoint of each major rookery and major haulout (Figure 5). Designated critical habitat for the Western DPS of Steller sea lion, including haulouts and rookeries, occurs within the MTR portion of the action area in the Aleutian Islands and the Bogoslof special aquatic foraging area. The MTR may also overlap with the critical habitat designated on and around the Pribilof Islands, St. Matthew Island, or St. Lawrence Island. An oil spill could alter the quality of critical habitat at a local scale. The most likely spills from the proposed action in the MTR would be a small spill of refined fuel oil (diesel) within Dutch Harbor or in offshore waters. This type of spill would be expected to evaporate and disperse quickly but may contact Steller sea lion critical habitat. Localized prey populations could be contaminated if a small spill were to occur. However, if a small spill were to reach the critical habitat, impacts would most likely be localized and temporary. The quality and availability of important habitat would not likely be impacted after a short recovery period, during which Steller sea lions would continue to have access to other areas of unaffected critical habitat nearby.

Steller sea lion critical habitat includes five PBFs including: 1) terrestrial zones that extend 3,000 feet (0.9 km) landward from each major haulout and major rookery in Alaska; 2) air zones that extend 3,000 feet (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska; 3) aquatic zones that extend 3,000 feet (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144$^{o}$ W longitude; 4) aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144$^{o}$W longitude; and 5) three special aquatic foraging areas (Shelikof Strait area, the Bogoslof area, and the Seguam Pass area) (50 CFR §226.202). Within the MTR of the action area, terrestrial and aquatic zones and the Bogoslof special aquatic foraging area may be impacted by project associated vessels through oil contamination.

<u>Terrestrial zones</u>
The terrestrial zones extend 3,000 feet landward from each major haulout and major rookery. Vessel traffic will not impact the land. Small spills associated with this project may occur, but are expected to evaporate or dissipate quickly in the ocean, minimizing impact to the coast to the point where it will have no measurable impact upon shoreline habitat near rookeries or haulouts.

<u>Air zones</u>
There are no anticipated impacts to the air zone above Steller sea lion critical habitat.

<u>Aquatic Zones east of 144$^{o}$W</u>
The action area does not include Steller sea lion aquatic zones east of 144$^{o}$W.

<u>Aquatic Zones west of 144$^{o}$W</u>
Aquatic zones west of 144$^{o}$W may experience small spills associated with vessel traffic from this

action. However, there are only one to two transits anticipated annually, the risk of small spills is very low, and any spills are expected to dissipate quickly.

Special aquatic foraging areas

The Bogoslof special aquatic foraging area is within the MTR portion of the action area. This area may experience small spills associated with vessel traffic from this action. However, there are only one to two transits anticipated annually, the risk of small spills is very low, and any spills are expected to dissipate quickly.

Due to the limited number of transits anticipated for this project and the ability of a small spill associated with the vessels in transit to dissipate quickly, the impacts of a small oil spill are very minor, and thus any adverse effects to Steller sea lion critical habitat will be immeasurably small. Furthermore, the probability of a small oil spill occurring is very small, and thus adverse effects to Steller sea lion critical habitat are extremely unlikely to occur. Therefore we conclude that the adverse effects from a small oil spill on Steller sea lion critical habitat are inconsequential and improbable.

## 6.3 Exposure and Response Analysis

As discussed in the *Approach to the Assessment* section of this opinion, exposure analyses are designed to identify the listed resources that are likely to co-occur with these effects in space and time and the nature of that co-occurrence. In this step of our analysis, we try 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.

As discussed in Section 2.1.2 above, the action includes mitigation measures that should avoid or minimize exposure of ringed and bearded seals; bowhead whales; Steller sea lions; and blue, humpback, fin, sperm, and North Pacific right whales to stressors.

Response analyses determine how listed species are likely to respond after being exposed to an action's effects on the environment or directly on listed species themselves. Our assessments try to detect the probability of lethal responses, physical damage, physiological responses (particular stress responses), behavioral responses, and social responses that might result in reducing the fitness of listed individuals. Ideally, our response analyses consider and weigh evidence of adverse consequences, beneficial consequences, or the absence of such consequences.

Possible responses by ESA-listed whales, seals, and Steller sea lions to project activities in this analysis are:

- Threshold shifts
- Auditory interference (masking)
- Behavioral responses
- Non-auditory physical or physiological effects

### 6.3.1 Description of possible responses

6.3.1.1 Threshold shifts

Exposure of marine mammals to very loud noise can result in physical effects, such as changes to sensory hairs in the auditory system, which may temporarily or permanently impair hearing. Temporary threshold shift (TTS) is a temporary hearing change, and its severity is dependent upon the duration, frequency, sound pressure, and rise time of a sound (Finneran and Schlundt 2013). TTSs can last minutes to days. Full recovery is expected, and this condition is not considered a physical injury. At higher received levels, or in frequency ranges where animals are more sensitive, permanent threshold shift (PTS) can occur. When PTS occurs, auditory sensitivity is unrecoverable (i.e., permanent hearing loss). The effect of noise exposure generally depends on a number of factors relating to the physical and spectral characteristics of the sound (e.g., the intensity, peak pressure, frequency, duration, duty cycle), and relating to the animal under consideration (e.g., hearing sensitivity, age, gender, behavioral status, prior exposures). Both TTS and PTS can result from a single pulse or from accumulated effects of multiple pulses from an impulsive sound source (i.e., impact pile or pipe driving) or from accumulated effects of non-pulsed sound from a continuous sound source (i.e., vibratory pile driving). In the case of exposure to multiple pulses, each pulse need not be as loud as a single pulse to have the same accumulated effect.

As it is a permanent auditory injury, the onset of PTS may be considered an example of “Level A harassment” as defined in the MMPA. TTS is by definition recoverable rather than permanent, and is treated as “Level B harassment” under the MMPA. Behavioral effects may also constitute Level B harassment, and are expected to occur at even lower noise levels than would generate TTS.

6.3.1.2 Auditory interference (masking)

The concept of acoustic interference is familiar to anyone who has tried to have a conversation in a noisy restaurant or at a rock concert. In such situations, the collective noise from many sources can interfere with one’s ability to understand, recognize, or even detect sounds of interest. Masking from anthropogenic noise sources may disrupt marine mammal communication when sound frequencies overlap communication frequencies used by marine mammals. Studies have shown that cetaceans’ response may be similar to that of humans speaking louder to communicate in a noisy situation. Holt et al. (2009) found that Southern Resident killer whales in Puget Sound near Seattle increased their call amplitude by 1 dB for every 1 dB increase in background noise levels.

Vocal changes in response to anthropogenic noise can occur across sounds produced by marine mammals, such as whistling, echolocation click production, calling, and singing. Changes to vocal behavior and call structure may result from a need to compensate for an increase in background noise. In cetaceans, vocalization changes have been reported from exposure to anthropogenic noise sources such as sonar, vessel noise, and seismic surveying. Vocalizations may also change in response to variation in the natural acoustic environment (e.g., from variation in sea surface motion (Dunlop et al. 2014)).

6.3.1.3 Behavior response

NMFS expects the majority of ESA-listed species responses to the proposed activities will occur in the form of behavioral response. Marine mammals may exhibit a variety of behavioral changes in response to underwater sound and the general presence of project activities and equipment, which can be generally summarized as:

- Modifying or stopping vocalizations
- Changing from one behavioral state to another
- Movement out of feeding, breeding, resting, or migratory areas

The response of a marine mammal to an anthropogenic sound will depend on the frequency, 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 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). For marine mammals, a review of responses to anthropogenic sound was first conducted by Richardson et al. (1995). More recent reviews (e.g., Nowacek et al. 2007, Southall et al. 2007, Southall et al. 2009, Ellison et al. 2012) focus on observations where the received sound level of the exposed marine mammal(s) was known or could be estimated.

Except for some vocalization changes that may be compensating for auditory masking, all behavioral reactions are assumed to occur due to a preceding stress or cueing response; however, stress responses cannot be predicted directly due to a lack of scientific data (see following section). Responses can overlap; for example, an increased respiration rate is likely to be coupled with a flight response. Differential responses are expected among and within species since hearing ranges vary across species and individuals, the behavioral ecology of individual species is unlikely to completely overlap, and individuals of the same species may react differently to the same, or similar, stressor.

Baleen whales have shown a variety of responses to impulsive sound sources, including avoidance, reduced surface intervals, altered swimming behavior, and changes in vocalization rates (Richardson et al. 1995, Southall et al. 2007). While most bowhead whales did not show active avoidance until within 8 km of seismic vessels (Richardson et al. 1995a), some whales avoided vessels by more than 20 km at received levels as low as 120 dB re 1 μPa rms. Additionally, Malme et al. (1988) observed clear changes in diving and respiration patterns in bowheads at ranges up to 73 km from seismic vessels, with received levels as low as 125 dB re 1 μPa.

Richardson and Malme (1993) point out that the data, although limited, suggest that stationary industrial activities producing continuous noise, such as stationary drillships, result in less dramatic reactions by whales than do moving sources, particularly ships. Several authors noted that migrating whales are likely to avoid stationary sound sources by deflecting their course slightly as they approached a source (Richardson et al. 1995).

Marine mammal responses to anthropogenic sound vary by species, state of maturity, prior exposure, current activity, reproductive state, time of day, and other factors (Ellison et al. 2012). This is reflected in a variety of aquatic, aerial, and terrestrial animal responses to anthropogenic noise that may ultimately have fitness consequences (Francis and Barber 2013).

#### 6.3.1.4 Non-Auditory Physical or Physiological Effects

Individuals exposed to noise can experience stress and distress, where stress is an adaptive response that does not normally place an animal at risk, and distress is a stress response resulting in a biological consequence to the individual. Both stress and distress can affect survival and productivity (Curry and Edwards 1998, Cowan and Curry 2002, Herráez et al. 2007, Cowan and Curry 2008). Mammalian stress levels can vary by age, sex, season, and health status (St. Aubin et al. 1996, Gardiner and Hall 1997, Hunt et al. 2006, Romero et al. 2008).

Anthropogenic activities have the potential to provide additional stressors above and beyond those that occur naturally. For example, various efforts have investigated the impact of vessels on marine mammals (both whale-watching and general vessel traffic noise) and demonstrated that impacts do occur (Erbe 2002, Williams et al. 2002, Williams and Ashe 2006, Williams and Noren 2009, Pirotta et al. 2015). In an analysis of energy costs to killer whales, Williams and Noren (2009) suggested that whale-watching in the Johnstone Strait resulted in lost feeding opportunities due to vessel disturbance. During the time following September 11, 2001, shipping traffic and associated ocean noise decreased along the northeastern U.S. This decrease in ocean noise was associated with a significant decline in fecal stress hormones in North Atlantic right whales, suggesting that chronic exposure to increased noise levels, although not acutely injurious, can produce stress (Rolland et al. 2012). These levels returned to their previous level within 24 hrs after the resumption of shipping traffic. Exposure to loud noise can also adversely affect reproductive and metabolic physiology (Kight and Swaddle 2011). In a variety of factors, including behavioral and physiological responses, females appear to be more sensitive or respond more strongly than males (Kight and Swaddle 2011).

If a sound is detected by a marine mammal, a stress response (e.g., startle or annoyance) or a cueing response (based on a past stressful experience) can occur. Whales, seals, and Steller sea lions use hearing as a primary way to gather information about their environment and for communication; therefore, we assume that limiting these abilities is stressful. Stress responses may also occur at levels lower than those required for TTS (Southall et al. 2007). Therefore, exposure to levels sufficient to trigger onset of PTS or TTS are expected to be accompanied by physiological stress responses (NRC 2003).

### 6.3.2 Marine Transit Route

All of the species analyzed in this opinion may be subject to impacts by vessel traffic along the MTR portion of the action area.

#### 6.3.2.1 Threshold shifts

The primary underwater noise associated with barging operations is the continuous cavitation noise produced by the propeller arrangement on the oceanic tugboats, especially when pushing or towing a loaded barge. For the marine transit route, the source level of approximately 170 dB at 1 meter are associated with oceanic tug boat noise and are anticipated to decline to 120 dB re 1μPa rms within 1.85 km (1.15 mi) of the source (Richardson et al. 1995a). There is no anticipated noise associated with the MTR that would rise to Level A harassment. Although some marine mammals could receive sound levels in exceedance of the acoustic threshold of 120 dB from the tugs during this proposed project, a threshold shift resulting from exposure to transiting barge operations is unlikely to occur because the duration of the exposure will be temporary.

6.3.2.2 Auditory interface (masking)
Steller sea lions, seals, and cetaceans are not expected to experience long durations of masking due to vessel traffic in the MTR associated with this project. There are only one to two transits expected annually, and the vessels will be underway. At 10 knots, vessels will ensonify a given point in space to levels above 120 dB for less than 9 minutes. Thus, the amount of time either a pinniped or a cetacean would experience masking from sound associated with a vessel underway is expected to be minimal. Implementation of mitigation measures regarding vessel distance to marine mammals further reduces the masking effects of vessels. Consequently, the very small amount of tug and barge traffic associated with this action is not expected to significantly disrupt normal marine mammal behavioral patterns. Because there are no expected impacts to individual cetaceans, seals, or Steller sea lions that rise to the level of Level B harassment, there is no expected impact at the population level.

6.3.2.3 Behavioral responses
BLM’s leasing activities that include one to two vessel transits annually could elicit a behavioral response by bowhead whales to vessel presence as well as vessel noise. The behavioral response may be stronger, as noted above, when the ship is underway as opposed to stationary (e.g., anchored offshore if the barge landing is not operating for some reason). Other ESA-listed whales, seals, and sea lions are also expected to demonstrate avoidance behavior to vessel traffic. However, due to the limited number of annual transits and the mitigation measures in Section 2.1.2 that reduce the potential for marine mammals to be negatively impacted by vessel noise and presence, we conclude that while an individual cetacean or pinniped may exhibit a behavioral response, the population is not expected to be impacted.

6.3.2.4 Non-auditory physical or physiological effects
While there may be a very limited stress response due to vessel presence, we do not anticipate any non-auditory or physiological effects from vessel transit through the MTR on cetaceans and pinnipeds associated with the action either at the individual or population level due to the low level of vessel transits annually and the mitigation measures described in Section 2.1.2.

### 6.3.3 Coastal Plain

The species expected to be impacted by activities in the waters off of the Coastal Plain portion of the action area and analyzed in this section include the bowhead whale, and ringed and bearded seals.

6.3.3.1 Threshold shifts
Vibroseis surveys. Vibroseis surveys include a level of ice road construction and maintenance done by graders and other snow removal equipment, water pump trucks, and ice augers. However, due to setbacks from ungrounded ice and other mitigation measures, threshold shifts due to Level A or B harassment are not expected for ringed seals. Bowhead whales and bearded seals are not expected to be impacted by vibroseis surveys due to spatial separation. Because threshold shifts are not anticipated at the individual level, they are also not anticipated to have effects at the population level.

Seawater treatment plant. Construction of the seawater treatment plant is not expected to cause threshold shifts in cetaceans or bearded seals because the plant will be built on land. The plant is not expected to cause threshold shifts for ringed seals because their habitat preference is ice edges in water greater than 10 feet deep and the ocean. The plant would be built on dry land, which is not habitat the ringed seal would typically utilize.

Barge landing area. Operations at the barge landing area are not expected to cause any sounds great enough to cause threshold shifts in pinnipeds or cetaceans. The barge landing area is in shallow water that is outside of cetacean habitat. Bearded seals are not expected to be impacted because the barge landing area is outside of their habitat as well. Individual ringed seals are not expected to be impacted by sounds associated with the barge landing area great enough to cause a threshold shift because sounds will be intermittent, and the barge landing area will only be utilized, at most, twice annually. Because there is no expected threshold shifts at the individual level, we also do not expect the populations to be impacted.

Aircraft and vessels. Cetaceans and pinnipeds may be subject to some noise associated with vessel and aircraft arrival and departure. However, the aircraft noise is expected to be minimal to non-existent because the airfield will be at the Central Processing Facility, which is predicted to be approximately 30 miles inland. Sounds associated with vessels at the barge landing, due to implemented mitigation measures, should not be at a level that would rise to harassment of any cetaceans or pinnipeds. Therefore we also anticipate no effects at the population level.

6.3.3.2 Auditory interface (masking)

Vibroseis surveys. BLM's leasing activities in the Coastal Plain portion of the action area are not expected to result in extended periods of time where masking could occur from sound from vibroseis surveys. Masking only exists for the duration of time that the masking sound is emitted. Cetaceans and bearded seals are not expected to be subject to sound associated with vibroseis surveys. Because there are no anticipated impacts at the individual level from vibroseis survey sounds, there is no anticipated impacts at the population level for bowhead whales or bearded seals. The ringed seal is not expected to be subject to vibroseis survey sounds that would rise to the level of masking, particularly due to the set-backs from ungrounded ice that are required. Because impacts are not anticipated at the individual ringed seal level, impacts are also not anticipated at the population level.

Seawater treatment plant. No masking is expected to occur from the construction of the seawater treatment plant on cetaceans or pinnipeds at the individual or population level.

Barge landing area. No masking is expected to occur on cetaceans or bearded seals at the barge landing area. Ringed seals, if in the area while a barge is arriving or departing, may experience temporary masking by vessel noise, but the noise is expected to be temporary in nature and not rise to harassment at the individual or population level.

Aircraft and vessels. BLM's leasing activities in the Coastal Plain portion of the action area are not expected to result in extended periods of time where masking could occur from sound from aircraft or vessels. Masking only exists for the duration of time that the masking sound is emitted. Cetaceans and pinnipeds would be subjected to aircraft and vessel sound for short periods of time as a plane, helicopter, or vessel arrives or departs, however not at levels that would subject them to Level A or B harassment. Additionally, mitigation measures, such as aircraft flight height restrictions and distance restrictions to marine mammals by vessels, will reduce exposure by cetaceans and pinnipeds to harassment by aircraft or vessels. Because there are no anticipated impacts at the individual level from aircraft or vessel sounds, there are no anticipated impacts at the population level for bowhead whales, ringed seals, or bearded seals.

6.3.3.3 Behavioral responses

Vibroseis surveys. Behavioral responses to vibroseis surveys are expected to include avoidance of the area and flushing from their lairs by ringed seals. Due to mitigation measures, including setbacks from the ungrounded ice edge, that reduce exposure by ringed seals to vibroseis surveys, we expect ringed seals will not exhibit significant behavioral responses. Behavioral responses such as flushing may happen at the individual level, but effects will not rise to the population level. Impacts from vibroseis surveys to bearded seals and bowhead whales are not expected to occur due to significant spatial separation of the activity from the species.

Seawater treatment plant. Construction of the seawater treatment plant should not cause behavioral responses by ringed or bearded seals because it will be set back from the shoreline to the extent that it is not on ungrounded ice used by ringed seals for lairs, nor is it at an ice lead, which is bearded seal habitat. It will not impact cetaceans because the plant is on land.

Barge landing area. Cetaceans and bearded seals are not expected to be impacted by construction or use of the barge landing due to their distribution relative to the location of the barge landing area; bowhead whales, other large cetaceans, and bearded seals, while they may be in Camden Bay in very low numbers at certain times of the year, will not be close enough to shore to be affected by activities at the barge landing. Bowhead whales may be affected by a tug and barge navigating through Camden Bay, but at the barge landing site, the water is too shallow for bowhead whales. The barge landing area may temporarily cause avoidance behavior by ringed seals as a barge arrives or departs the landing. However, due to mitigation measures for vessel traffic while a marine mammal is present and the minimal length of time the vessel would be moving (docking or departing), the avoidance behavior would be short in duration. While individual ringed seals may exhibit an avoidance behavior at the barge landing area, this activity is not expected to impact the population.

Aircraft and vessels. Because the landing field is expected to be inland, there are no expected behavioral responses by pinnipeds or cetaceans. Should the aircraft need to come closer to the shoreline, mitigation measures will reduce the impacts of aircraft on marine mammals that would result in behavioral responses, such as specific altitude requirements and distances to maintain from marine mammals. For those reasons, aircraft are not expected to cause behavioral changes in pinnipeds or cetaceans at the individual or population level.

Vessels may cause behavioral changes to individual cetaceans or pinnipeds in waters off of the Coastal Plain portion of the action area due to vessel presence or noise. The behavioral response of cetaceans and pinnipeds may be stronger when the vessel is underway versus stationary. Bowhead whales and ringed and bearded seals are expected to demonstrate avoidance behavior to vessel traffic as well. However, due to the limited number of annual transits (at most, two transits per year) and the mitigation measures in Section 2.1.2 that reduce the potential for marine mammals to be negatively impacted by vessel noise and presence, we conclude that while a small number of cetaceans or pinnipeds may exhibit a behavioral response, the populations are not expected to be impacted.

6.3.3.4 Non-auditory physical or physiological effects

We expect individuals may experience acoustic harassment that does not rise to Level A or B harassment, may experience masking, and may exhibit behavioral responses from project activities. Therefore, we expect ESA-listed whales and seals may experience stress responses. The whales and seals may be displaced from the area, with the stress response dissipating shortly after they leave. Alternately, they may remain in the stressful environment and remain in a state of heightened stress until the stressor ceases.

Vibroseis surveys. Stress responses to vibroseis surveys are not expected to occur for bearded seals and bowhead whales due to the spatial separation of their utilized habitat versus the location of the vibroseis surveys. Stress responses in ringed seals to vibroseis surveys may occur temporarily, but due to mitigation measures, including setbacks from the ungrounded ice edge that reduce exposure by ringed seals to vibroseis surveys and vehicle setbacks from basking seals (See section 2.1.2.3, Measure 2: Nearshore Seismic Activities (vibroseis)), we expect ringed seals will not exhibit significant stress responses.

Seawater treatment plant. We do not expect any ringed seal stress responses to arise from construction of the seawater treatment plant. Due to spatial separation of the plant from ringed seal habitat, we expect no masking and no acoustic harassment that rises to Level A or B harassment, and thus no anticipated stress responses by ringed seals at the individual or population level. Bowhead whales and bearded seals are not expected to be impacted by construction of the seawater treatment plant.

Barge landing area. The barge landing area activities are not expected to cause stress response in ringed seals because operations are not anticipated to cause Level A or B harassment nor any lesser behavioral response except at the individual level if a ringed seal moves or flushes due to an incoming or departing barge. Due to the low level of transits, the barge landing area will only be in operation twice a year, thus reducing exposure to ringed seals of noise and activity associated with barging activities. Bearded seals and bowhead whales are expected to be spatially separated from the barge landing during open water periods.

Aircraft and vessels. Due to the low level of vessel transits annually and the mitigation measures described in Section 2.1.2, while there may be a very limited stress response due to vessel presence, we do not anticipate any non-auditory or physiological effects from vessel activity in waters off of the Coastal Plain portion of the action area on cetaceans or pinnipeds associated with the action either at the individual or population level. Aircraft are not expected to cause any stress responses in bearded or ringed seals or bowhead whales because of the spatial separation between project-related aircraft traffic patterns and marine habitats.

# 7. CUMULATIVE EFFECTS

“Cumulative effects” are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Therefore, the majority of future development that is likely to occur in or near the action area will be in the federally managed National Petroleum Reserve and the marine outer continental shelf and is excluded from the following discussion. Likewise, undeveloped lands that have been conveyed to Alaska Native corporations under the Alaska Native Claims Settlement Act are almost entirely wetlands and therefore require CWA Section 404 permits for development, which would trigger consultation under the ESA. A brief discussion of nonfederal actions contributing to potential cumulative effects follows.

Effects of climate change, harvest of fish and wildlife, noise, ongoing oil and gas activities, authorized and unauthorized pollutants and discharges (including spills), scientific research, commercial shipping, and other vessel traffic each could contribute to cumulative effects on listed whales, Steller sea lions, and seals. Most development along the central Beaufort Sea coast in general, and in the action area in particular, is located in terrestrial habitats. Marine drill sites have been developed (e.g., Oooguruk, Nikaitchuq, and Northstar) and terrestrial oil and gas facilities in the coastal zone are prevalent beginning approximately 40 miles west of the mouth of Marsh Creek, one of the potential barge landing sites on the Coastal Plain (e.g., multiple facilities near Oliktok Point, Milne Point, and Point McIntyre, as well as the Alpine, Endicott, Badami, and Point Thomson fields, and the future Liberty Development). The oil and gas industry will continue to develop into the foreseeable future.

No future plans have been publicized for residential expansion in the Coastal Plain portion of the action area. The local population of people is low (approximately 350 inhabitants in Kaktovik), however their summer and winter subsistence activities occur throughout the Coastal Plain. The amount of human activity in the Coastal Plain is relatively localized and seasonal. The species considered in BLM's BA occur rarely and in very low numbers near the Coastal Plain and the MTR portions of the action area, and since coastal access is not expected to be increased by the proposed action, subsistence activities would not be expected to substantially increase.

The effects of continuing climate change pose major challenges to the future well-being of many marine and terrestrial species, probably leading to population declines and range contraction for some ice-dependent marine species. Some continuing non-Federal activities are reasonably certain to contribute to climate change within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *versus* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 5.0).

We expect fisheries, subsistence harvest, noise, oil and gas activities, scientific research, and ship strikes will continue into the future. We expect moratoria on commercial whaling and bans on commercial sealing in the U.S. will remain in place, aiding in the recovery of ESA-listed whales and pinnipeds. We also expect that with commercial and private vessels operating in the Bering, Chukchi, and Beaufort Seas, the risk of non-permitted oil and pollutant discharges will continue at current levels or increase in proportion to increases in vessel traffic.

# 8. INTEGRATION AND SYNTHESIS

The Integration and Synthesis section is the final step of NMFS's assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 6) to the environmental baseline (Section 5) and the cumulative effects (Section 7) to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) result in appreciable reductions in the likelihood of the survival or recovery of the species in the wild by reducing its numbers, reproduction, or distribution; or (2) result in the adverse modification or destruction of critical habitat as measured through alterations that appreciably diminish the value of designated critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species (Section 4).

As we discussed in the *Approach to the Assessment* section of this opinion, we begin our risk analyses by asking whether the probable physical, physiological, behavioral, or social responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals. If we would not expect individuals of the listed species exposed to an action's effects to experience reductions in the current or expected future survivability or reproductive success (that is, their fitness), we would not expect the action to have adverse consequences on the viability of the populations those individuals represent or the species those populations comprise (Stearns 1977, Brandon 1978, Mills and Beatty 1979, Stearns 1992, Anderson 2000). Therefore, if we conclude that individuals of the listed species are not likely to experience reductions in their fitness, we would conclude our assessment because we would not expect the effects of the action to affect the performance of the populations those individuals represent or the species those population comprise. If, however, we conclude that individuals of the listed species are likely to experience reductions in their fitness as a result of their exposure to an action, we then determine whether those reductions would reduce the viability of the population or populations the individuals represent and the "species" those populations comprise (species, subspecies, or distinct populations segments of vertebrate taxa).

As part of our risk analyses, we consider the consequences of exposing endangered or threatened species to all of the stressors associated with the proposed action, individually and cumulatively, given that the individuals in the action area for this consultation are also exposed to other stressors in the action area and elsewhere in their geographic range.

In this opinion, our analysis focused on the lease activities that BLM has proposed, which will occur over the next six years, and all subsequent oil and gas activities through year 85. The activities that are likely to continue through year 85 include the activities associated with maintenance, exploration, development, production, and abandonment/reclamation. There are many variables that may affect a lessee's future activities (e.g., whether exploratory activities will lead to new wells, the price of oil and gas, etc.). Although we do not have information on any lessee's activities after 2024, it is likely that a lessee's activities will be subject to review and approval by BLM and BLM will make its approval of any activity with the potential to take a marine mammal contingent upon the lessee having a valid MMPA incidental take authorization from NMFS. These activities therefore will be subject to ESA consultation. Given the lack of information we have on a lessee's activities from year 7 through year 85, we assume that they will be similar to those analyzed in this opinion, and the analysis considers the potential effects from them.

## 8.1 Cetacean Risk Analysis

Based on the results of the Exposure Analysis, we expect bowhead whales will not be adversely affected by exposure to seismic exploration noise, or vessel or aircraft noise. With the implementation of mitigation measures, exposure to vessel noise, aircraft noise, vibroseis survey noise, and small oil spills may occur, but the expected effects on bowhead whales are not expected to result in take. The probability of impacts on marine mammal prey occurring from the proposed action is very small. Finally, vessel strikes are extremely unlikely to occur due to the included mitigation measures.

Based on the results of the Exposure Analysis, we expect fin, sperm, blue, humpback, and North Pacific right whales will not be measurably affected by exposure to vessel noise. With implementation of mitigation measures, exposure to vessel noise and small oil spills may occur, but the expected effects are not expected to result in take. The probability of impacts on marine mammal prey occurring from the proposed action is very small, and thus adverse effects are extremely unlikely to occur. Finally, exposure to large and very large oil spills, vessel strike, and unauthorized discharge is extremely unlikely to occur.

Our consideration of probable exposures and responses of listed whales to oil and gas exploration, development, production, and abandonment activities associated with the proposed action is designed to help us assess whether those activities are likely to increase the extinction risks or jeopardize the continued existence of listed whales. The activities associated with this action include vibroseis surveys of shorefast ice and inland, potential need for a seawater treatment plant, installation of a barge landing, and vessel and air traffic. Implementation of mitigation measures in association with the actions would further reduce the impacts of these stressors to listed cetaceans, and some of these future activities may require additional ESA section 7 consultation.

Vessel strikes are considered unlikely due to the implementation of mitigation measures and the low number of anticipated transits (at most, two annually). We have records of one fin whale strike in western Alaska and two bowhead strikes, and no strikes for any other cetacean species analyzed in this opinion in the MTR portion of the action area (there are no documented humpback whale strikes north of Dutch Harbor). This information reinforces our view that vessel strikes from the small amount of traffic associated with this action are unlikely.

Based on the localized nature of small oil spills, the relatively rapid weathering expected for <1,000 bbl of oil, the small number of transits in the proposed action, and the safeguards in place to avoid and minimize oil spills, we conclude that the probability of the proposed action causing a small oil spill and exposing listed cetaceans in waters off of the Coastal Plain or MTR portions of the action area is extremely small.

Although the vessel transit and noise associated with shipping activities of the lessee(s) are likely to cause some individual whales to experience changes in their behavioral states that might have adverse consequences (Frid and Dill. 2002), these responses are not likely to alter the physiology, behavioral ecology, and social dynamics of individual whales in ways or to a degree that would reduce their fitness because it is anticipated that the whales will continue to actively forage in waters around operations or will seek alternative foraging areas during brief periods of disturbance. The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animal's energy budget, time budget, or both (the two are related because foraging requires time). Large whales such as fin and humpbacks have an ability to store substantial amounts of energy, which allows them to survive for months on stored energy during migration and while in their wintering areas, and their feeding patterns allow them to acquire energy at high rates. The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to markedly reduce the energy budgets of listed cetaceans (i.e., reduce the amount of time they spend at the ocean's surface, increase their swimming speed, change their swimming direction to avoid tug operations, change their respiration rates, increase dive times, reduce feeding behavior, or alter vocalizations and social interactions). Their probable exposure to noise sources is not likely to reduce their fitness or current or expected future reproductive success or reduce the rates at which they grow, mature, or become reproductively active. Therefore, these responses are not likely to reduce the abundance, reproduction rates, and growth rates (or increase variance in one or more of these rates) of the populations those individuals represent.

As mentioned in the Environmental Baseline section, bowhead whales may be impacted by anthropogenic activities present in the Coastal Plain portion of the action area. However, there is a low degree of human activity with their associated risk factors. The risk factors include ship strikes, oil and gas development, subsistence hunting, climate change, noise pollution from aircraft and vessels, and potential oil spills. The whales along the MTR may experience, in addition to the impacts associated with two vessel transits annually, impacts from other commercial vessels in transit, commercial fishing gear entanglement, marine debris, and climate change. The species may be affected by multiple threats at any given time, compounding the impacts of the individual threats.

As we discussed in the Approach to the Assessment section of this opinion, an action that is not likely to reduce the fitness of individual whales would not be likely to reduce the viability of the populations those individual whales represent (that is, we would not expect reductions in the reproduction, numbers, or distribution of such populations). For the same reasons, an action that is not likely to reduce the viability of those populations is not likely to increase the extinction probability of the species those populations comprise. As a result, the proposed action is not likely to appreciably reduce the sperm, blue, bowhead, North Pacific right whale, fin, Mexico DPS humpback, or Western North Pacific DPS humpback whales' likelihood of surviving or recovering in the wild.

The strongest evidence supporting the conclusion that the proposed action will likely have minimal impact on fin, humpback, and bowhead whale populations is the estimated growth rate of these populations in the sub-Arctic and North Pacific. Zerbini et al. (2006) estimated the rate of increase for fin whales in coastal waters south of the Alaska Peninsula to be around 4.8 percent (95 percent CI: 4.1-5.4 percent ) for the period 1987-2003. The maximum net productivity rate for the Northeast Pacific fin whale stock is estimated to be 4 percent (Muto et al. 2019). While there is no accurate estimate of the maximum productivity rate for the Central North Pacific stock of humpback whales, it is thought to be 7 percent (Muto et al. 2019). Bowhead whale population numbers also increased at a rate of 3.7 percent from 1968 to 2011 (Muto et al. 2019) with only one entanglement reported from 2012-2016. Sperm whales population numbers are unknown, but there are no documented ship strikes in the Bering Sea or northern Alaska, and only one entanglement in western Alaska. There are no documented adverse interactions between North Pacific right whales and vessels in the action area. The Eastern North Pacific blue whale stock abundance is uncertain with little evidence to support a population increase, while the Central North Pacific stock is estimated at 81 individuals (Carretta et al. 2017). There have been no documented interactions with blue whales from 2012-2016. Despite exposure to vessel traffic, a number of humpback and fin whale entanglements in fishing gear, and one known unauthorized subsistence take of a humpback whale in Alaska, this increase in the number of listed whales suggests that the stress regime these whales are exposed to in the MTR and Coastal Plain portions of the action area has not reduced their range and frequency of occurrence in the action area.

Due to the implementation of mitigation measures, including reducing vessel speed when visibility is limited and/or when whales are spotted, and because of the limited number of transits annually, exposures to vessel strikes and to vessel noise at received levels that could cause harassment to listed whales are expected to be minimal. Individuals may experience masking by vessel sounds, and may exhibit behavioral responses from vessel transit. Therefore, ESA-listed whales may experience stress responses. If whales are not displaced and remain in a stressful environment (i.e., within the behavioral harassment zone), we expect the stress response will dissipate shortly after the individual leaves the area or after the cessation of the acoustic stressor. TTS and PTS may occur if a listed species is within the Level B or Level A harassment zone, respectively; however, the severity of TTS and PTS depends on the duration, frequency, sound pressure, and rise time of a sound (Finneran and Schlundt 2013). No exposure of cetaceans to Level A or Level B harassment (that would cause PTS or TTS) is anticipated from this proposed action. Although vessel transit is likely to cause individual whales to experience changes in their behavioral states that might have adverse consequences (Frid and Dill. 2002), these responses are not likely to alter the physiology, behavioral ecology, or social dynamics of individual whales in ways or to a degree that would reduce their fitness. The proposed action therefore is not expected to reduce the reproduction, numbers, or distribution of listed cetaceans.

Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the listed cetaceans in this action and there are no takes estimated for listed cetaceans for this opinion.

## 8.2 Pinniped Risk Analysis

Based on the results of the exposure analysis (see Section 6.3), we expect ringed and bearded seals and Steller sea lions will not be exposed to underwater noise associated with this action that may result in take. Exposure to vessel noise and small oil spills may occur but effects would be immeasurably small and would not rise to the level of take for ringed and bearded seals and Steller sea lions.

Exposure to aircraft noise and noise from vibroseis surveys may occur but would not rise to the level of take of ringed or bearded seals. Stressors associated with on-ice activities (ice road and ice trail maintenance and operation) are not expected to result in Level B harassment from noise for ringed seals, Level B harassment through physical presence for ringed seals, or mortality for ringed seals. Finally, exposure to vessel strike is extremely unlikely to occur for Steller sea lions and ringed and bearded seals. Mitigation measures required for ice roads and aircraft operations further reduce the impacts to ringed and bearded seals, and mitigation measures for and low number of vessel operations further reduce impacts to ringed and bearded seals and Steller sea lions (BLM 2019).

The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animal's energy budget, time budget, or both (the two are related because foraging requires time). Fall and early winter periods, prior to the occupation of breeding sites, are important in allowing female ringed seals to accumulate enough fat stores to support estrus and lactation (Kelly et al. 2010). Fall and early winter overlaps with ice road construction. Winter is when the vibroseis surveys would occur, when pups and their mothers are in their lairs. The individual and cumulative energy costs of the behavioral responses that may be exhibited are not likely to reduce the energy budgets of ringed seals. As a result, the ringed seal's probable responses (i.e., tolerance, avoidance, short-term masking, and short-term vigilance behavior) to close approaches by vehicles and their probable exposure to noise or human disturbance are not likely to reduce the fitness, or current or expected future reproductive success, or reduce the rates at which they grow, mature, or become reproductively active. Therefore, these exposures are not likely to reduce the abundance, reproduction rates, and growth rates (or increase variance in one or more of these rates) of the populations those individuals represent. For physical disturbance, if an active ringed seal lair is not detected and is impacted by heavy equipment, the adult female could likely escape into the water but the pup could be killed by crushing or premature exposure to the water or frigid air. However, this is not anticipated because of required set-backs from where water exists beneath ungrounded sea ice. The set-backs are required for two reasons: 1) to lessen the probability of encountering a lair, and 2) to lessen the probability of losing equipment into the water. Equipment is only permitted to operate on grounded ice out to depths of 10 feet with the exception of snow machines to place and retrieve recorders per the nearshore seismic activities mitigation measure (2.d). Additionally, there is a 500 foot exclusion zone around known seal locations per the nearshore seismic activities mitigation measure (2.c). Any impacts to individual ringed seals are not likely to reduce the abundance, reproductive rates, or growth rates of the populations those individuals represent.

Based on the localized nature of small oil spills, the relatively rapid weathering expected for <1,000 bbl of oil, the small number of spills anticipated with the proposed action, and the safeguards in place to avoid and minimize oil spills, we conclude that the probability of any activity causing a small oil spill and exposing ringed or bearded seals, or Steller sea lions, is extremely small. If exposure were to occur, due to the ephemeral nature of small, oil spills, NMFS does not expect detectable responses from pinnipeds, and we would consider the effects of the proposed action to be minor.

The activities associated with barging to the Coastal Plain are not expected to cause individual ringed and bearded seals and Steller sea lions to experience changes in their behavioral states that might have adverse consequences that alter the physiology, behavioral ecology, and social dynamics of individual seals or sea lions in ways or to a degree that would reduce their fitness. Transiting vessels will emit sounds that are expected to be below the Level B harassment level for pinnipeds, and those sounds will be short term as the vessel passes. If the ringed or bearded seals are actively foraging in the waters off of the Coastal Plain when a barge arrives at the barge landing site, they can actively avoid the vessel by swimming away or hauling out. The proposed action therefore is not expected to reduce the reproduction, numbers, or distribution of listed pinnipeds.

Based on the best information currently available, the proposed action is not expected to appreciably reduce the likelihood of survival and recovery of the listed pinnipeds.

### 8.3 Critical Habitat Risk Analysis

As discussed above in Section 6.2, effects to critical habitat are limited to the potential for small spills along the portions of the MTR that are nearest to critical habitat for North Pacific right whales and western DPS Steller sea lions. The probability of a small oil spill occurring is very small, and any spills that do occur are expected to evaporate or dissipate quickly in the ocean; thus adverse effects to critical habitat are extremely unlikely. All adverse effects to critical habitat therefore will not appreciably diminish the value of the critical habitat for the conservation of North Pacific right whales and western DPS Steller sea lions.

## 9. CONCLUSION

After reviewing the current status of the species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of Beringia DPS bearded seals, Arctic ringed seals, western DPS Steller sea lions, bowhead whales, blue whales, fin whales, Western North Pacific DPS and Mexico DPS humpback whales, North Pacific right whales, and sperm whales. The action is also not likely to destroy or adversely modify designated critical habitat for North Pacific right whales and Steller sea lions.

## 10. INCIDENTAL TAKE STATEMENT

Pursuant to section 7(a)(2) implementing regulations (80 FR 26832, May 11, 2015; ITS rule), an Incidental Take Statement is not required at the programmatic level for framework programmatic actions where information on the specific number, location, timing, frequency, and intensity of actions is unknown, and any incidental take resulting from any actions subsequently authorized, funded, or carried out under the program will be addressed in separate ESA section 7 consultations (see 50 CFR §402.14(i)(6)). A framework programmatic action means, for purposes of an ITS, a Federal action that approves an agency program or plan that is the framework for the development of future action(s) authorized, funded, or carried out at a later time, and any take of a listed species would not occur unless and until those future action(s) are authorized, funded, or carried out and subject to further section 7 consultation (50 CFR §402.02).

The Coastal Plain Lease Sale in and of itself will not affect listed marine mammals and will not alone result in the incidental take of listed marine mammals (80 FR 26832, 26835; May 11, 2015). However, if blocks are leased in the sale, the subsequent authorization of exploration permits or plans, permits to drill, and development and production plans may affect listed species and require BLM and other action agencies to initiate project-specific consultation associated with those subsequent actions, including NMFS's issuance of MMPA incidental take authorizations. Therefore, consultation will be required for all future activities related to the Coastal Plain leasing program that may affect listed species.

For each subsequent consultation, NMFS will determine whether a future activity under this framework program is or is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habitat of such species. NMFS also will determine whether take is reasonably certain to occur and will specify the reasonable and prudent measures necessary or appropriate to minimize the amount and extent of take, with implementing terms and condition, in accordance with 50 CFR 402.14(i).

For all future activities associated with the Coastal Plain leasing program, project-specific information will aid in the assessment of effects on listed species and the amount and extent of incidental take resulting from that project. Project-specific information also will aid in the development of sufficiently specific and meaningful reasonable and prudent measures and terms and conditions intended to minimize and monitor impacts from each future activity (80 FR 26832, 26835-36; May 11, 2015). In addition to the mitigation measures provided in this opinion, additional mitigation measures may be included in subsequent section 7 consultations.

NMFS will compare the effects of future project-specific actions and associated take levels to the effects anticipated under this overarching Coastal Plain lease opinion. If the project-specific effects on the listed species or designated critical habitat will occur in a manner or to an extent not considered in this opinion, reinitiation of consultation on the Coastal Plain Lease Sale biological opinion will be required.

Reasonable and prudent measures (RPMs) and Terms and Conditions (T&Cs) are usually included in biological opinions. However, under a framework programmatic consultation, all subsequent activities that could cause take will be subject to section 7 consultation, thus NMFS will craft specific and meaningful RPMs and T&Cs at that time so that they are relevant to the specific activity(ies). For a framework programmatic action, it is preferred to develop RPMs and T&Cs once NMFS has more detailed, project specific information from the subsequent consultations on future activities (80 FR 26832, 26835-36; May 11, 2015).

# 11. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

In order to keep NMFS's Protected Resources Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, BLM should notify NMFS of any conservation recommendations they implement in their final action.

1. BLM should conduct or fund surveys to determine densities and distribution of ringed and bearded seals on ice and in marine waters offshore of the Coastal Plain.
2. BLM should conduct or fund surveys to determine densities and distribution of cetaceans in marine waters offshore of the Coastal Plain.

## 12. REINITIATION OF CONSULTATION

As provided in 50 CFR 402.16, reinitiation of consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) the amount or extent of incidental take is exceeded, (2) new information reveals effects of the agency action on listed species or designated critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat not considered in this opinion, or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount of incidental take is exceeded, section 7 consultation must be reinitiated immediately.

## 13. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act (DQA)) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

### 13.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful to NOAA, BLM, and the general public. These consultations help to fulfill multiple legal obligations of the named agencies. The information is also useful and of interest to the general public as it describes the manner in which public trust resources are being managed and conserved. The information presented in these documents and used in the underlying consultations represents the best available scientific and commercial information and has been improved through interaction with the consulting agency.

This consultation will be posted on the NMFS Alaska Region website http://alaskafisheries.noaa.gov/pr/biological-opinions/. The format and name adhere to conventional standards for style.

### 13.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, ‘Security of Automated Information Resources,’ Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

### 13.3 Objectivity

***Standards:*** This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01 et seq.

***Best Available Information:*** This consultation and supporting documents use the best available information, as referenced in the literature cited section. The analyses in this opinion contain more background on information sources and quality.

***Referencing:*** All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

***Review Process:*** This consultation was drafted by NMFS staff with training in ESA implementation, and reviewed in accordance with Alaska Region ESA quality control and assurance processes.

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