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) Biological Opinion

POA-2018-00276, Erickson Residence Marine Access Project, Juneau, Alaska

NMFS Consultation Number: AKRO-2019-01827

Action Agencies: **U.S. Army Corps of Engineers**
NMFS Office of Protected Resources

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Steller Sea Lion, Western DPS (*Eumatopias jubatus)*	Endangered	Yes	No	No
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	Yes	No	N/A

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:

for James W. Balsiger, Ph.D.
Regional Administrator

Date: November 15, 2019

https://doi.org//10.25923/51ca-zv58

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TERMS AND ABBREVIATIONS

ADF&G	Alaska Department of Fish and Game
BA	Biological Assessment
BMPs	Best management practices
CBJ	City and Borough of Juneau
CBJ D&H	City and Borough of Juneau Docks and Harbors Department
CFR	Code of Federal Regulations
CV	Curriculum vitae
CY	Cubic yard(s)
DPS	Distinct Population Segment
EDPS	Eastern Distinct Population Segment
ESA	Endangered Species Act
ESCA	Endangered Species Conservation Act
ft	feet
FMP	Fishery Management Plan
GOA	Gulf of Alaska
HTL	High tide line
IHA	Incidental Harassment Authorization
IPCC	Intergovernmental Panel on Climate Change
ITS	Incidental Take Statement
m	Meter(s)
MDPS	Mexico Distinct Population Segment
MHW	Mean high water
mi	Mile(s)
min	Minute(s)
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
MSE	mechanically stabilized earth
NMFS	National Marine Fisheries Service
NPS	National Park Service
PBFs	Physical or biological features
PCE	Primary constituent element
PND	PND Engineers, Inc.
PR1	Office of Protected Resources, NMFS Headquarters
PRD	Protected Resources Division, Alaska NMFS
PSO	Protected Species Observers
PTS	Permanent Threshold Shifts
RPA	Reasonable and Prudent Alternative
SEL	Sound Exposure Level
SPL	Sound Pressure Level
SSL	Steller sea lion
SSV	Sound source verification

sq	Square
TTS	Temporary Threshold Shifts
USACE	US Army Corps of Engineers
USC	United States Code
USFWS	US Fish and Wildlife Service
WDPS	Western Distinct Population Segment
WNP	Western North Pacific
ZOE	Zone of Exclusion
ZOI	Zone of Influence
AEWC	Alaska Eskimo Whaling Commission
BSAI	Bering Sea/Aleutian Islands
BWASP	Bowhead Whale Feeding Ecology Study
CAA	Conflict Avoidance Agreement
CI	Confidence Interval

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)).

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 to minimize such impact, and sets forth terms and conditions to implement those measures.

In this document, the action agencies are the US Army Corps of Engineers (USACE), which proposes to authorize construction activities associated with the Erickson Residence Marine Access Project, and the NMFS Office of Protected Resources, Permits and Conservation Division (PR1), which proposes to permit Marine Mammal Protection Act (MMPA) Level A take (*i.e.*, take by injury or mortality) and Level B take (*i.e.*, take by harassment) of Steller sea lions (SSL) and humpback whales in conjunction with the noise levels and associated activities resulting from the construction. The consulting agency for this proposal is NMFS's Alaska Region. This document represents NMFS's biological opinion (opinion) on the effects of this proposal on endangered and threatened species and designated critical habitat.

The opinion and incidental take statement were prepared by NMFS in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, et seq.), and implementing regulations at 50 CFR 402.

The opinion and ITS are 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 construction activities associated with the Erickson Residence Marine Access Project. These actions have the potential to affect the Mexico Distinct Population Segment (MDPS) of humpback whales (*Megaptera novaeangliae*) and the Western Distinct Population Segment (WDPS) of Steller sea lions *(Eumetopias jubatus)*.

This opinion is based on information provided in the Revised Incidental Harassment Authorization (IHA) Application (PND Engineers 2019a); the Proposed Incidental Harassment Authorization Federal Register Notice (84 FR 50387); the Revised Biological Assessment for the Erickson Residence Marine Access Project (PND Engineers 2019b); the updated project proposals; email and telephone conversations between NMFS Alaska Region and NMFS PR1 staff; 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 May 8, 2019, NMFS PR1 received a request from Jim Erickson for an IHA to take marine mammals incidental to a project to replace an existing dock in Auke Bay, Alaska. The USACE submitted a request to initiate section 7 consultation to NMFS Alaska Region Protected Resources Division (PRD) on May 7, 2018, and designated PND Engineers, Inc. (PND) as the non-federal representative on June 6, 2019 (USACE 2019). On June 3, 2019, PRD submitted a 30-day review letter outlining insufficiencies in the initiation package and requesting additional information. After discussions with NMFS PR1, PND submitted a revised IHA application on June 11, 2019 and forwarded it to PRD to address issues identified in the June 3, 2019 insufficiency letter. On June 14, 2019 PRD and PR1 conducted an early review team meeting and identified remaining questions concerning the action which were resolved and the application deemed adequate and complete by PR1 and PRD on August 12, 2019. PR1 submitted a section 7 initiation request to PRD on September 19, 2019. PRD initiated joint consultation with PR1 and USACE on September 19, 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).

The project is located within Section 35, Township 40 South, Range 65 East of the Copper River Meridian; CBJ Tax Parcel ID 4B1801030131, Legal Description USS 1547 TR 1A in Juneau, Alaska, approximate geographic coordinates 58.3606° North and 134.6458° West (Figure 1). The property owner, Jim Erickson, is proposing to demolish an existing private moorage facility that has deteriorated and replace it with a new facility consisting of a concrete retaining wall, an aluminum truss approach structure, and steel gangway leading to a new timber moorage float equipped with utilities. Construction is anticipated in Spring or Fall 2020.

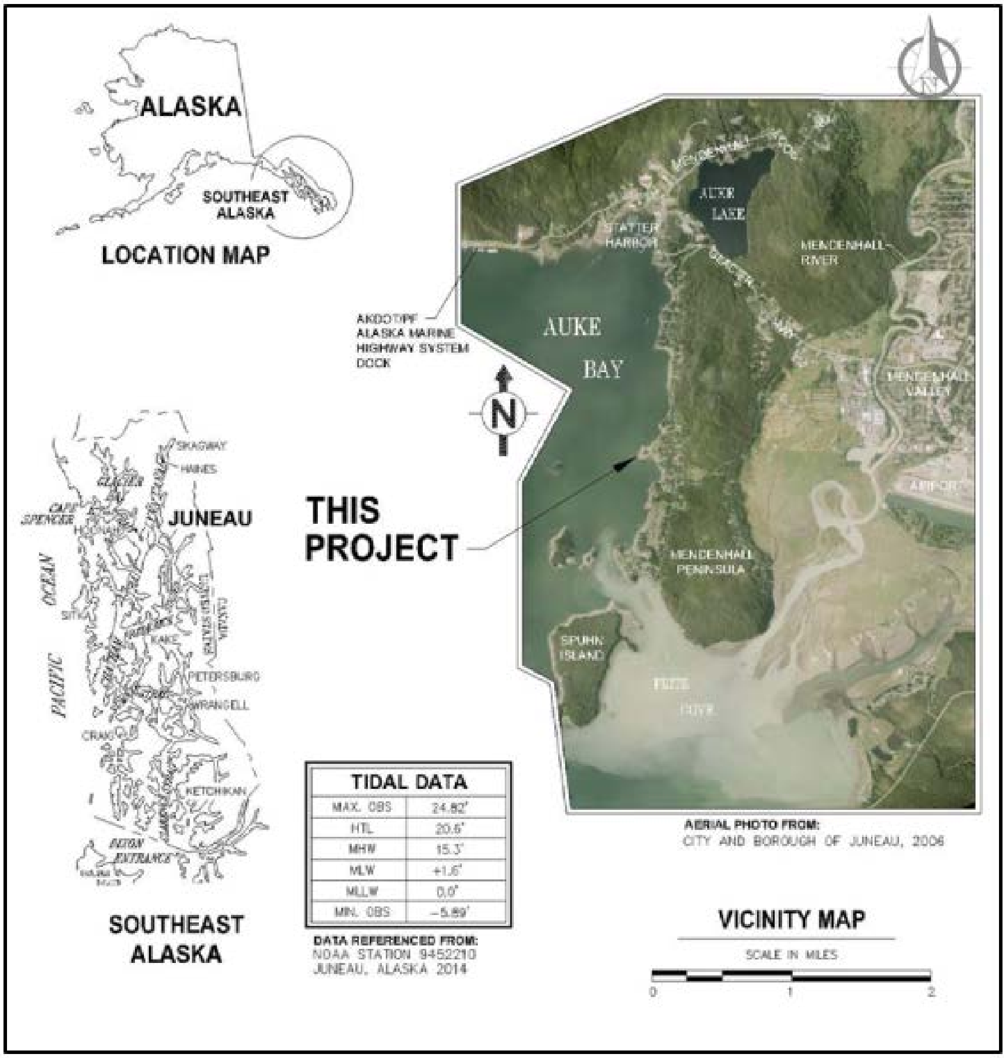

Figure 1. Vicinity Map of Erickson Residence Marine Access Project (PND Engineers 2019b).

2.1.1 Proposed Activities

Exact scheduling of the Erickson Residence Marine Access Project is dependent on the contractor's schedule but it will occur in either the Spring, prior to May 1 or after June 30, or in the Fall between September 1 and December 31 of 2020. The following general construction sequence is anticipated, subject to adjustment by the construction contractor's means and methods:

- Float/steel fabrication
- Mobilization of equipment
- Demolition
- Concrete retaining wall construction
- Approach/gangway installation
- Pile driving and float installation
- Utility Installation
- Demobilization of equipment

Table 1 summarizes the materials anticipated to be removed and installed below the high tide level (HTL).

Demolition of the existing moorage facility will be performed with cranes, a barge, vibratory hammer (for pile removal), various hand tools and labor forces. Vibratory pile removal will generally consist of clamping the vibratory hammer to the pile and vibrating the hammer while extracting to a point where the pile is temporarily secured and removal can be completed with crane line rigging under tension. The pile would then be completely removed from the water by hoisting with crane line rigging and placing on the uplands or deck of the barge.

Materials and equipment for the project will be transported by barge to the site, with the exception of concrete and fill materials, which will be transported over the highway. Concrete for the retaining wall will be poured in the dry when the site is dewatered. An anchor on each corner of the barge will be deployed for position control during pile driving/removal and overnight securing. The barge will be accompanied by a tug boat at all times. Removed materials will be secured alongside the barge, with the exception of the removed pilings which will be placed on the barge. After construction is complete, the demolition debris will be loaded on the barge and the contractor will be required to dispose of demolished items in accordance with all federal, state, and local regulations.

It is anticipated that all pile driving will be done with a vibratory hammer, with a possibility of down-the-hole (DTH) drilling due to a rock outcropping in the project vicinity. The vibratory hammer proposed is a High Pressure Systems Incorporated Model 200 with a rated energy of 2,000 in-lbs, 1,600 vibrations per minute and a hammer force of 73 tons. Pile driving will be conducted from a stationary barge platform. If necessary, DTH drilling will be utilized to install rock sockets. An impact hammer may be used for piles that encounter soils too dense to penetrate with the vibratory equipment. If needed, the impact hammer would be a Del Mag 193-32 42, with an energy per blow of 800 foot pounds (ft-lbs) and 37-52 blows per minute. The floats will be unloaded from a barge and placed in the water.

Should rock be encountered before the required penetration is achieved, drilling of rock sockets may be required for the two larger 20-inch (51- centimeter) float pilings as they require more embedment to reach the necessary capacity to withstand the high lateral loads on the float. No drilling is anticipated for the four 12.75-inch (32.5- centimeter) steel approach bearing piles. The existing wood pilings (to be removed) are sufficient indicators that vibratory driving in the intertidal zone above MLLW is practical and drilling will not be required for the 12.75-inch (32.5- centimeter) piles. Table 2 provides an overview of pile driving activities. Sound source levels and calculated impact isopleths are discussed in detail in Section 5.

Table 1. Project Components for Erickson Residence Marine Access Project.

Construction Type	Project Component	Total materials below high tide level (Elevation = 20.6 feet (6.3 meters))
Demolition and Disposal	10 feet x 36 feet (3 meters x 11 meters) Timber Approach	360 square feet (33.5 square meter)
	30 feet (9.1 meters) Aluminum	30 linear feet (9.1 meters)

Construction Type	**Project Component**	**Total materials below high tide level (Elevation = 20.6 feet (6.3 meters))**
	Gangway	
	135 feet (41.1 meters) of Sectional Hinged Beach Floats	135 linear feet (41.2 meters)
	10 feet x 40 feet (3 meters x 12.2 meters) Mooring Float	400 square feet (37.2 square meters)
	12 to 16 inches (31 to 41 centimeter) Timber Piles	6 each
New Construction	Concrete Retaining Wall	0.58 cubic yards (0.44 cubic meters) of Concrete 0.29 cubic yards (0.22 cubic meters) of Armor Rock Side Slope Material
	107 feet (32.6 meters) Aluminum Truss Approach Structure	107 linear feet (32.6 m)
	6 feet x 60 feet (1.8 meters x 18.3 meters) Steel Gangway	360 square feet (33.5 square meters)
	20 feet x 60 feet (6.1 meters x 18.3 meters) Timber Deck Float	1,200 square feet (111.5 square meters)
	12.75 inches (32.5 centimeters) Diameter Steel Piles	4 each
	20 inches (51 centimeters) Diameter Steel Piles	2 each

Table 2. Summary of Pile Driving Activities for the Erickson Residence Marine Access Project.

Activity	# Piles	Pile Size	Method	Average Piles per Day	Driving Days	Strike per Pile or Seconds per Pile
Timber Pile Removal	6	12 to 16 inch (0.31 to 0.41 meters)	Vibratory	3 to 6	1 to 2	900 seconds
Steel Pipe Pile Installation	4	12.75 inch (0.325 meters)	Vibratory	2 to 4	1 to 2	1,800 seconds
			Impact	2 to 4	1 to 2	150 strikes
	2	20 inch (0.51 meters)	Vibratory	1	2	7,200 seconds
			Impact	1	2	150 strikes
			Drilling	1	2	18,000 seconds

2.1.2 Mitigation Measures

2.1.2.1 All Construction Activities

The proposed project intends to avoid impacts to marine mammals and the marine environment to the extent practicable, but some impacts cannot be avoided entirely, as this project is dependent upon maritime access and construction activity. While the IHA contains mitigation measures that address all marine mammals, this Opinion deals exclusively with the mitigation measures for ESA-listed MDPS humpback whales and WDPS Steller sea lions. The following measures and BMPs will be incorporated by the applicant in order to avoid, reduce intensity, or otherwise minimize potential impacts:

- Mr. Erickson is required to conduct briefings for construction supervisors and crews, the monitoring team, and contractor staff prior to the start of all in-water work (e.g., pile driving and removal activity), and when new personnel join the work, in order to explain responsibilities, communication procedures, the marine mammal monitoring protocol, and operational procedures.
- For in-water construction, heavy machinery activities other than pile driving (e.g., use of barge-mounted excavators, or dredging), if a marine mammal comes within 10 m, operations will cease and vessels will reduce speed to the minimum level required to maintain steerage and safe working conditions.
- The moorage improvements will be maintained in a manner that does not introduce any pollutants or debris into Auke Bay or cause a migration barrier for fish.
- The moorage improvement structures will minimize contaminant releases and will be maintained in a manner that avoids incidental introduction of deleterious materials into Auke Bay.
- Moorage improvement structures will provide barrier-free migration and vertical movement for marine and estuarine fish in Auke Bay.
- Fuels, lubricants, chemicals and other hazardous substances will be stored above the high tide line to prevent spills.
- Oil booms will be readily available for containment should any releases occur.
- To prevent spills or leakage of hazardous material during construction, standard spill-prevention measures will be implemented during construction. The contractor will

provide and maintain a spill clean-up kit on-site at all times.
- Mr. Erickson will monitor equipment and gear storage areas for drips or leaks regularly, including inspection of fuel hoses, oil drums, oil or fuel transfer valves and fittings, and fuel storage that occurs at the project site. Equipment will be maintained and stored in accordance with Best Management Practices to prevent spills.
- If contaminated or hazardous materials are encountered during construction, all work in the vicinity of the contaminated site will be stopped until a corrective action plan is devised and implemented to minimize impacts on surface waters and organisms in the project area.
- To minimize impacts to pink and chum salmon fry and coho and Chinook salmon smolt, and DIPAC hatchery net pen species in Auke Bay, contractors will refrain from pile installation and removal activities from May 1 through June 30.

2.1.2.2 Exclusion and Disturbance Zones

Exclusion Zone (i.e., shutdown zone) **–** For all pile driving/removal and DTH drilling activities, Mr. Erickson will establish an exclusion zone intended to encompass the area within which sound pressure levels (SPLs) equal to or exceeding the auditory injury criteria for cetaceans and pinnipeds. The purpose of a shutdown zone is to define an area within which shutdown of activity would occur upon sighting of a marine mammal (or in anticipation of an animal entering the defined area), thus preventing injury (Level A harassment) of marine mammals (see Response Analysis Section 6.3). Modeled radial distances for exclusion zones are shown in Table 11. However, more conservative shutdown zones for pinnipeds and cetaceans will be used during monitoring to prevent any form of incidental Level A exposure for MDPS humpback whales and WDPS Steller sea lions (Table 3). The placement of Protected Species Observers (PSOs) during all pile driving, removal and drilling activities will ensure that the shutdown zones are fully visible.

If a marine mammal is entering or is observed within an established shutdown zone, pile driving must be halted or delayed. Pile driving may not commence or resume until either the animal has voluntarily left and been visually confirmed beyond the shutdown zone or 15 minutes have passed without subsequent detections.

Disturbance Zone – Disturbance zones are the areas in which SPLs equal or exceed 160 and 120 dB rms (Level B harassment for impulse and continuous sound, respectively). Disturbance zones provide utility for monitoring conducted for mitigation purposes (i.e., exclusion zone monitoring) by establishing monitoring protocols for areas adjacent to the exclusion zones. Monitoring of disturbance zones enables PSOs to be aware of and communicate the presence of marine mammals in the project area but outside the exclusion zone and thus prepare for potential shutdowns of activity. However, the primary purpose of disturbance zone monitoring is for documenting instances of Level B harassment; disturbance zone monitoring is discussed in greater detail later (see Section 2.1.2.4 - Proposed Monitoring and Reporting). Nominal radial distances for disturbance zones are shown in Table 3 and Figure 2.

Given the significant distances and size of the disturbance zones for vibratory pile driving and DTH drilling (e.g., 1.36-12.1 kilometers), it is impossible to guarantee that all animals would be observed or to make comprehensive observations of fine-scale behavioral reactions to sound, and only a portion of the zone (e.g., what may be reasonably observed by visual PSOs) would be observed. In order to document observed instances of harassment, PSOs record all marine mammal observations, regardless of location. The PSO's location, as well as the location of the pile being driven, is known from a GPS measurement or reading?. The location of the animal is estimated as a distance from the PSO, which is then compared to the location from the pile. It may then be estimated whether the animal was exposed to sound levels constituting incidental harassment based on predicted distances to relevant thresholds in post-processing of observational and acoustic data, and a precise accounting of observed incidences of harassment created. This information may then be used to extrapolate observed takes to reach an estimate of actual total takes.

Table 3. Radii (in meters) of Level A Exclusion and Level B Disturbance Zones.

Activity	Level A Exclusion		Level B Disturbance
	MDPS Humpback Whales	WDPS Steller Sea Lions	All Species
Vibratory Timber Pile Removal	10	10	1,360
Vibratory Pile Driving (12.75-inch)	10	10	2,155
Vibratory Pile Driving (20-inch)	20	10	5,415
Drilling	75	10	12,100
Impact Pile Driving 12.75-inch	65	10	140
Impact Pile Driving 20-inch	135	10	1,000

Soft Start for Impact Pile Driving

The use of a soft start procedure for impact pile driving is believed to provide additional protection to marine mammals by warning or providing a chance to leave the area prior to the hammer operating at full capacity, and typically involves a requirement to initiate sound from the hammer at reduced energy followed by a waiting period. This procedure is repeated two additional times. It is difficult to specify the reduction in energy for any given hammer because of variation across drivers and, for impact hammers, the actual number of strikes at reduced energy will vary because operating the hammer at less than full power results in "bouncing" of the hammer as it strikes the pile, resulting in multiple "strikes."

For impact driving soft starts, the action agency will ensure that an initial set of strikes are delivered at reduced (40%) energy, followed by a thirty-second waiting period. This sequence will be repeated three times. A soft start must be implemented at the start of each day's impact pile driving and at any time following cessation of impact pile driving for a period of thirty minutes or longer. Soft start will be required at the beginning of each day's impact pile driving work and at any time following a cessation of impact pile driving of 30 minutes or longer. Soft start procedures will not be required for vibratory hammering operations.

Pre-Activity Monitoring

Prior to the start of daily in-water construction activity, or whenever a break in pile driving of 30 minutes or longer occurs, the PSO(s) will observe the shutdown zones for a period of 30 minutes. The shutdown zone will be considered cleared when a marine mammal has not been observed within the zone for that 30-minute period. If a marine mammal is observed within the shutdown zone, a soft-start cannot proceed until the animal has left the zone or has not been observed for 30 minutes (for cetaceans) and 15 minutes (for pinnipeds). If the shutdown zone has been observed to be clear of marine mammals for 30 minutes, in-water construction can commence and work can continue even if visibility becomes impaired within the Level B harassment zone. When a marine mammal permitted for Level B take is present in the Level B harassment zone, piling activities may begin and Level B take will be recorded. As stated above, if the entire Level B zone is not visible at the start of construction, piling or drilling activities can begin. If work ceases for more than 30 minutes, the pre-activity monitoring of both the Level B and shutdown zone will commence.

2.1.2.3 Project-connected vessel Interactions

1. Project-connected vessels will adhere to the Alaska Humpback Whale Approach Regulations when transiting to and from the project site (see 50 CFR §§ 216.18, 223.214, and 224.103(b)). These regulations require that all vessels:

   a) Not approach within 100 yards of a humpback whale, or cause a vessel or other object to approach within 100 yards of a humpback whale,
   b) Not place vessel in the path of oncoming humpback whales causing them to surface within 100 yards of vessel,
   c) Not disrupt the normal behavior or prior activity of a whale, and
   d) Operate at a slow, safe speed when near a humpback whale (safe speed is defined in regulation (see 33 CFR § 83.06)).

2. Vessels will also follow the NMFS Marine Mammal Code of Conduct for other species of marine mammals, which, among other recommendations, recommend maintaining a minimum distance of 100 yards; not encircling, or trapping marine mammals between boats, or boats and shore; and putting engines in neutral if approached by a whale or other marine mammal to allow the animals(s) to pass.

2.1.2.4 Monitoring and Reporting

Marine mammal monitoring will be conducted for all in-water construction activities. The MMPA implementing regulations at 50 CFR 216.104(a)(13) indicate that requests for authorizations must include the suggested means of accomplishing the necessary monitoring and reporting that will result in increased knowledge of the species and of the level of taking or impacts on populations of marine mammals that are expected to be present in the proposed action area. Effective reporting is critical for both compliance as well as ensuring that the most value is obtained from the required monitoring. Monitoring and reporting requirements should contribute to improved understanding of one or more of the following:

- Occurrence of marine mammal species or stocks in the area in which take is anticipated (e.g., presence, abundance, distribution, density);
- Nature, scope, or context of likely marine mammal exposure to potential stressors/impacts (individual or cumulative, acute or chronic), through better understanding of: (1) Action or environment (e.g., source characterization, propagation, ambient noise); (2) affected species (e.g., life history, dive patterns); (3) co-occurrence of marine mammal species with the action; or (4) biological or behavioral context of exposure (e.g., age, calving or feeding areas);
- Individual marine mammal responses (behavioral or physiological) to acoustic stressors (acute, chronic, or cumulative), other stressors, or cumulative impacts from multiple stressors;
- How anticipated responses to stressors impact either: (1) Long-term fitness and survival of individual marine mammals; or (2) populations, species, or stocks;
- Effects on marine mammal habitat (e.g., marine mammal prey species, acoustic habitat, or other important physical components of marine mammal habitat); and
- Mitigation and monitoring effectiveness.

Visual Monitoring

- Monitoring will be conducted 30 minutes before, during, and 30 minutes after pile driving and removal activities. In addition, PSOs will record all incidents of marine mammal occurrence, regardless of distance from activity, and will document any behavioral reactions in concert with distance from piles being driven or removed. Pile driving activities include the time to install or remove a single pile or series of piles, as long as the time elapsed between uses of the pile driving equipment is no more than thirty minutes.
- At least two PSOs will be on duty during all pile driving activities. A primary PSO will be stationed at the construction site where pile driving would occur. As per the applicant's Marine Mammal Mitigation and Monitoring Plan, an additional PSO will be positioned in a vessel in Auke Bay to observe the larger monitoring zones (Figure 2). Most of the shoreline of Auke Bay is privately owned and unavailable for PSOs to access. Additionally, PSOs cannot be stationed on the shore of the various islands in Auke Bay due to safety concerns. Therefore, a vessel-based PSO is the most practicable position for this project. PSOs will be positioned to enable observation of as much of the Level B zone as possible.
- PSOs will scan the waters using binoculars, and/or spotting scopes, and will use a handheld GPS or range-finder device to verify the distance to each sighting from the project site.
- All PSOs will be trained in marine mammal identification and behaviors and are required to have no other project-related tasks while conducting monitoring. In addition, monitoring will be conducted by qualified PSOs, who will be placed at the best vantage point(s) practicable to monitor for marine mammals and implement shutdown/delay procedures when applicable by calling for the shutdown to the hammer operator.
- Qualified PSOs will be trained and/or experienced professionals, with the following minimum qualifications:
    - Visual acuity in both eyes (correction is permissible) sufficient for discernment of

moving targets at the water's surface with ability to estimate target size and distance; use of binoculars may be necessary to correctly identify the target.
    - Independent PSOs (i.e., not construction personnel).
    - PSOs must have their CVs/resumes submitted to and approved by NMFS. NMFS will approve CVs/resumes within three business days.
    - PSOs must have either an advanced education in biological science or related field (i.e., undergraduate degree or higher required) OR PSOs may substitute experience or training for education.
    - Experience and ability to conduct field observations and collect data according to assigned protocols (this may include academic experience).
    - Experience or training in the field identification of marine mammals, including the identification of behaviors.
    - Sufficient training, orientation, or experience with the construction operation to provide for personal safety during observations.
    - Writing skills sufficient to prepare a report of observations including but not limited to the number and species of marine mammals observed; dates and times when in-water construction activities were conducted; dates and times when in-water construction activities were suspended to avoid potential incidental injury from construction sound of marine mammals observed within a defined shutdown zone; and marine mammal behavior.
    - Ability to communicate orally, by radio or in person, with project personnel to provide real-time information on marine mammals observed in the area as necessary.

Reporting

PR1 requires that PSOs use approved data forms. Among other pieces of information, the USACE will ensure that NMFS receives detailed records of any implementation of shutdowns, including the distance of animals to the pile and description of specific actions that ensued and resulting behavior of the animal, if any. In addition, the USACE will attempt to distinguish between the number of individual animals taken and the number of incidences of take.

- A draft marine mammal monitoring report will be submitted to PR1 within 90 days after the completion of construction activities. It will include an overall description of work completed, a narrative regarding marine mammal sightings, and associated marine mammal observation data sheets. Specifically, the report must include:
    - Date and time that monitored activity begins or ends;
    - Construction activities occurring during each observation period;
    - Weather parameters (e.g., percent cover, visibility);
    - Water conditions (e.g., sea state, tide state);
    - Species, numbers, and, if possible, sex and age class of marine mammals;
    - Description of any observable marine mammal behavior patterns, including bearing and direction of travel, distance from pile driving activity, and if possible, the correlation to SPLs;
    - An estimated total take extrapolated from the number of marine mammals observed during the course of construction activities;
    - Distance from pile driving and drilling activities to marine mammals and distance from the marine mammals to the observation point;

  - Description of implementation of mitigation measures (e.g., shutdown or delay);
  - Locations of all marine mammal observations; and
  - Other human activity in the area.
- If no comments are received from NMFS within 30 days, the draft final report will constitute the final report. If comments are received, a final report addressing NMFS comments must be submitted within 30 days after receipt of comments.

Interim Reports
Brief, monthly summaries of PSO observations and recorded takes will be provided to NMFS AKR during construction. USACE will have PSOs record the area within which they are monitoring on a daily basis. The observations and area observed will then be used to estimate a density value that is used to extrapolate observed take to the unobserved area.

Reporting injured or dead marine mammals
1. In the event that a project-related activity likely causes the take of a marine mammal in a manner not authorized by the IHA and this Opinion, USACE will ensure that the activities it has authorized cease immediately and that the incident is reported to the Protected Resources Division, NMFS, and the Alaska Regional Stranding Coordinator. The report will include the following information:

- Time and date of the incident;
- Description of the incident;
- Environmental conditions (e.g., Beaufort sea state, visibility);
- Description of all marine mammal observations in the 24 hours preceding the incident;
- Species identification or description of the animal(s) involved;
- Fate of the animal(s); and
- Photographs or video footage of the animal(s) (if equipment is available).

Activities will not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with USACE to determine what is necessary to minimize the likelihood of further prohibited take and ensure ESA compliance. USACE will not authorize resumption of activities until notified by NMFS via letter, email, or telephone.

2. In the event that USACE discovers an injured or dead marine mammal, and the PSO determines that the cause of the injury or death is unknown and the death is relatively recent (e.g., in less than a moderate state of decomposition as described in the next paragraph), USACE will immediately report the incident to the Protected Resources Division, NMFS, and the NMFS Alaska Stranding Hotline (1-877-095-7773) and/or by email to the Alaska Regional Stranding Coordinator (barbara.mahoney@noaa.gov). The report will include the same information identified in the paragraph above. Activities will be able to continue while NMFS reviews the circumstances of the incident. NMFS will work with USACE to determine whether modifications in the activities are appropriate.

3. In the event that USACE discovers an injured or dead marine mammal and the lead PSO determines that the injury or death is not associated with or related to the activities authorized in the IHA (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), USACE will report the incident to the Protected Resources Division, NMFS,

and the NMFS Alaska Stranding Hotline and/or by email to the Alaska Regional Stranding Coordinator, within 24 hours of the discovery. USACE will provide photographs, video footage (if available), or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

2.1.2.3 Compensatory Habitat Mitigation

Mr. Erickson has requested a permit for the proposed project under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act from the USACE. To receive that permit, Mr. Erickson will be required to avoid, minimize, and mitigate impacts to intertidal habitat. For impacts that cannot be avoided or minimized, Mr. Erickson will coordinate compensatory mitigation with USACE.

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 action area for this Opinion will include all proposed activities outlined in Section 2.1.1. We define the action area for this consultation to include the area within which project-related noise levels are ≥120 dB re 1 μPa (rms) (i.e., the point where no measurable effect from the project would occur). Noise levels associated with down-the-hole drilling will extend further than other components of the proposed action, thus the action area extends 12,100 meters from the project site (Figure 2) where drilling related noise reaches 120 dB, which encompasses all other phases as well as the dredged material disposal site. The action area also includes the transit area for the barge and tug, which will make one round trip from the Juneau-Douglas Bridge, remaining onsite for the duration of the project. The travel distance from Juneau-Douglas Bridge to the project site is approximately 37 miles (60 kilometers).

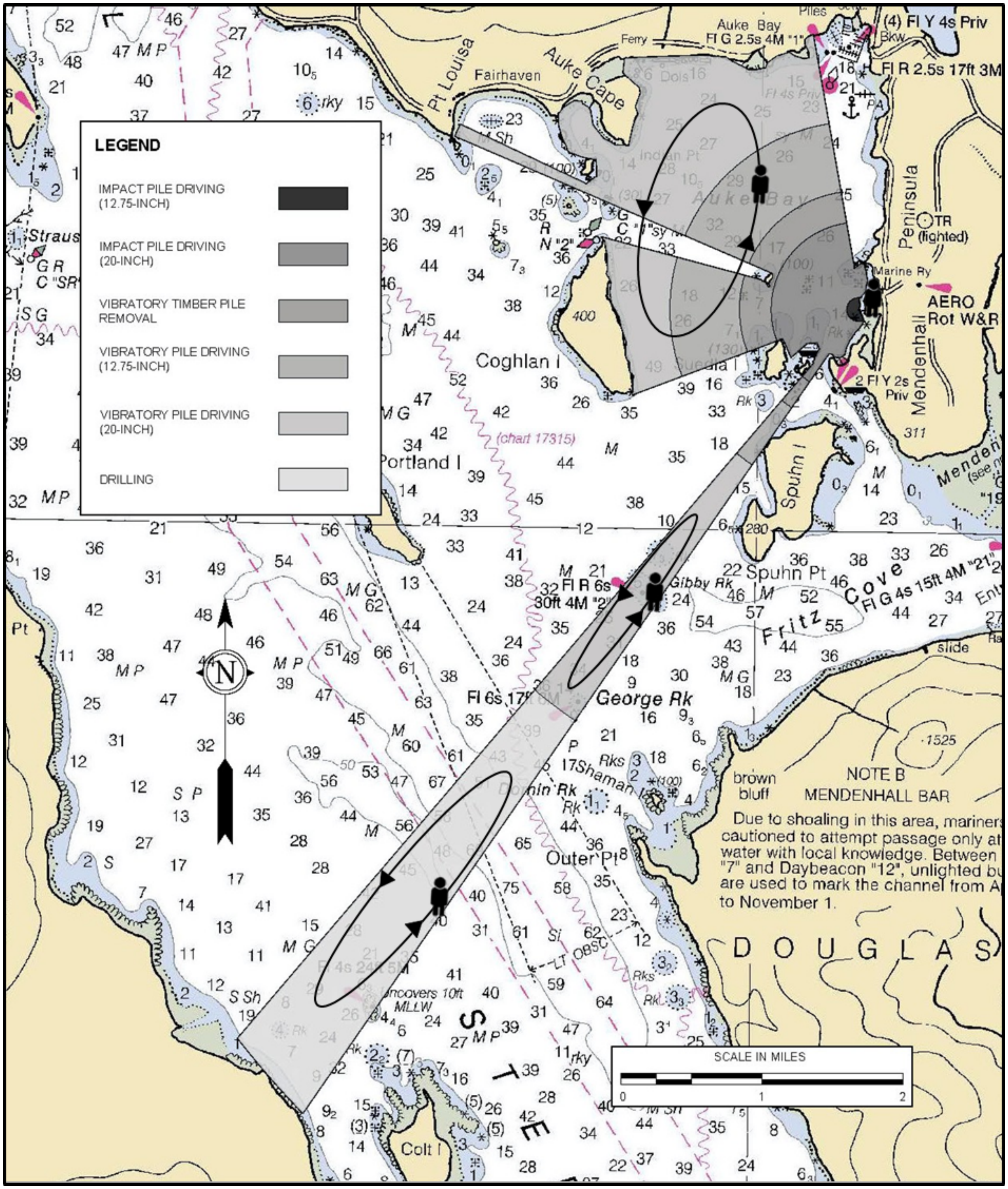

Figure 2. Erickson Residence Marine Access Project Action Area and impact zones for level B harassment for impact pile driving, vibratory pile driving and down-the-hole drilling. Ellipses with arrows indicate the vessel surveys proposed by the applicant to monitor for marine mammals.

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 2, 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 designation of critical habitat for Steller sea lions uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) 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 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. This section 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. Species and critical habitat status are discussed in Section 4 of this opinion.
- Describe the environmental baseline 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. The environmental baseline is discussed in Section 5 of this opinion.

- 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. 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. Cumulative effects are considered in Section 7 of this opinion.
- 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) reduce 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

Two species of marine mammals listed under the ESA under NMFS's jurisdiction may occur in the action area— western Distinct Population Segment (WDPS) Steller sea lions and Mexico DPS (MDPS) humpback whales. No critical habitat occurs within the action area. This Opinion considers the effects of the proposed action on these species (Table 4).

Table 4. Listing status and critical habitat designation for marine mammals considered in this Opinion.

Species	Status	Listing	Critical Habitat
Steller Sea Lion, WDPS (*Eumetopias jubatus*)	Endangered	May 5, 1997, 62 FR 24345	August 27, 1993, 58 FR 45269
Humpback Whale, Mexico DPS (*M egaptera nov aeangliae*)	Threatened	September 8, 2016, 81 FR 62260	Not designated

4.1 Critical Habitat Not Likely to be Adversely Affected

On August 27, 1993, NMFS designated critical habitat for Steller sea lions based on the location of terrestrial rookery and haulout sites, spatial extent of foraging trips, and availability of prey items (58 FR 45269). Designated critical habitat is listed in 50 CFR § 226.202, and includes: 1) a terrestrial zone that extends 3,000 ft (0.9 km) landward from the baseline or base point of each major rookery and major haulout; 2) an air zone that extends 3,000 ft (0.9 km) above the terrestrial zone of each major rookery and major haulout, measured vertically from sea level in California and Oregon; 3) an aquatic zone that extends 3,000 ft (0.9 km) seaward in state and federally managed waters from the baseline or basepoint of each major rookery and major haulout in Alaska that is east of 144° W longitude; 4) an aquatic zone that extends 20 nm (37 km) seaward in state and federally managed waters from the baseline or basepoint of each major rookery and major haulout in Alaska that is west of 144° W longitude; and 5) three special aquatic foraging areas in Alaska: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area.

The action area does not overlap Steller sea lion critical habitat. The Benjamin Island haulout is the closest designated critical habitat to the action area; it is east of 144° W longitude and is over 25 km northwest of the project area (Figure 3). We do not expect the project to affect Steller sea lion critical habitat.

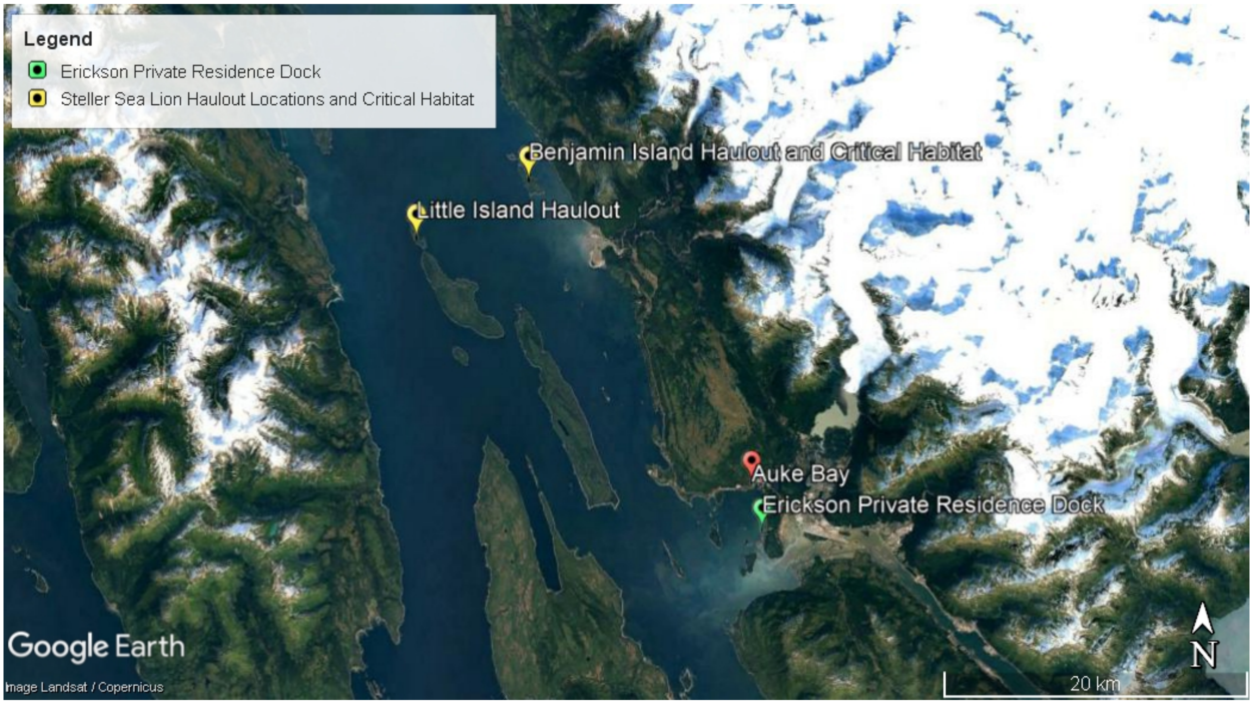

Figure 3. Steller Sea Lion Critical Habitat near Auke Bay in relation to Erickson Private Residence Dock Project Site

4.2 Climate Change

In accordance with NMFS guidance on analyzing the effects of climate change (Sobeck 2016), NMFS assumes that climate conditions will be similar to the status quo throughout the length of the effects of this construction project. Climate conditions are likely to change over the life of the dock post-construction; however, as the project is proposing to replace an existing dock that serves a private residence, there should be no additional impacts from the dock post-construction in comparison to the project not occurring under changing climate conditions. We present an overview of the potential climate change effects on WDPS Steller sea lions and MDPS humpback whales and their habitat below.

There is widespread consensus within the scientific community that atmospheric temperatures on earth 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 explicit, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (Pachauri and Reisinger 2007).

The Intergovernmental Panel on Climate Change (IPCC) estimated that average global land and sea surface temperature has increased by 0.6°C (±0.2) since the mid-1800s, with most of the change occurring since 1976. This temperature increase is greater than what would be expected given the range of natural climatic variability recorded over the past 1,000 years (Crowley 2000). The IPCC reviewed computer simulations of the effect of greenhouse gas emissions on observed climate variations that have been recorded in the past and evaluated the influence of natural phenomena such as solar and volcanic activity. Based on their review, the IPCC concluded that natural phenomena are insufficient to explain the increasing trend in land and sea surface temperature, and that most of the warming observed over the last 50 years is likely to be attributable to human activities (Stocker et al. 2013).

Continued greenhouse gas emissions at or above current rates would cause further warming and induce many changes in the global climate system during the 21st century that would very likely be larger than those observed during the 20th century (Watson and Albritton 2001). Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine, coastal, and terrestrial ecosystems in the foreseeable future (Houghton 2001, McCarthy 2001, Parry 2007). Climate change would result in increases in atmospheric temperatures, changes in sea surface temperatures, increased ocean acidity, changes in patterns of precipitation, and changes in sea level (Stocker et al. 2013).

The indirect effects of climate change on WDPS Steller sea lions and MDPS humpback whales would likely include changes in the distribution of temperatures suitable for many stages of their life history, the distribution and abundance of prey, and the distribution and abundance of competitors or predators.

4.3 Status of Listed Species

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02.

This section consists of narratives for each of the endangered and threatened species that occur in the action area and that may be adversely affected by the proposed action. In each narrative, we present a summary of information on the population structure and distribution of each species to provide a foundation for the exposure analyses that appear later in this opinion. Then we summarize information on the threats to the species and the species' status given those threats to provide points of reference for the jeopardy determinations we make later in this opinion. That is, we rely on a species' status and trend to determine whether or not an action's direct or indirect effects are likely to increase the species' probability of becoming extinct.

After the *Status* subsection of each narrative, we present information on feeding, prey selection, diving, and social behavior of the different species because those behaviors help determine how certain activities may impact each species. We also summarize information on the vocalization and hearing of the species to inform our assessment of how the species are likely to respond to sounds produced from the proposed activities.

More detailed background information on the status of these species can be found in a number of published documents including stock assessment reports on Alaska marine mammals (Muto et al. 2017b), and recovery plans for humpback whales (NMFS 1991a) and Steller sea lions (NMFS

2008b).

4.3.1 MDPS Humpback Whales

4.3.1.1 Population Structure and Status

The humpback whale was listed as endangered under the Endangered Species Conservation Act (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. NMFS recently conducted a global status review and changed the status of humpback whales under the ESA. The globally listed species was divided into 14 DPSs, four of which are endangered, one is threatened, and the remaining nine are not listed under the ESA (81 FR 62260; September 8, 2016).

Wade et al. (2016) analyzed humpback whale movements throughout the North Pacific Ocean between winter breeding areas and summer feeding areas, using a comprehensive photo-identification study of humpback whales in 2004-2006 during the Structure of Populations, Levels of Abundance and Status of Humpbacks (SPLASH) project. A multi-strata mark recapture model was fit to the photo-identification data using a six-month time-step, with the four winter areas and the six summer areas defined to be the sample strata. The four winter areas corresponded to the four North Pacific DPSs: Western North Pacific (WNPDPS), Hawaii (HDPS), Mexico (MDPS), and Central America (CADPS). The analysis was used to estimate abundance within all sampled winter and summer areas in the North Pacific, as well as to estimate migration rates between these areas. The migration rates were used to estimate the probability that whales from each winter/breeding area were found in each of the six feeding areas. The probability of encountering whales from each of the four North Pacific DPSs in various feeding areas is summarized in Table 5 below (NMFS 2016a).

Table 5. Probability of encountering humpback whales from each DPS in the North Pacific Ocean (columns) in various feeding areas (on left). Adapted from Wade et al. (2016).

Summer Feeding Areas	North Pacific Distinct Population Segments			
	Western North Pacific DPS (endangered)[1]	**Hawaii DPS (not listed)**	**Mexico DPS (threatened)**	**Central America DPS (endangered)[1]**
Kamchatka	100%	0%	0%	0%
Aleutian Islands / Bering / Chukchi	4.4%	86.5%	11.3%	0%
Gulf of Alaska	0.5%	89%	10.5%	0%
Southeast Alaska / Northern British Columbia	0%	93.9%	6.1%	0%
Southern British Colombia / Washington State	0%	52.9%	41.9%	14.7%
Oregon/California	0%	0%	89.6%	19.7%

[1]For the endangered DPSs, these percentages reflect the 95% confidence interval of the probability of occurrence in order to give the benefit of the doubt to the species and to reduce the chance of underestimating potential takes.

Whales from the WNP, Mexico, and Hawaii DPSs overlap on feeding grounds off Alaska, and are not visually distinguishable. All waters off the coast of Alaska may contain ESA-listed humpbacks. Critical habitat has not been designated for the WNPDPS or the MDPS (NMFS 2016a).

The MDPS is comprised of approximately 3,264 (CV=0.06) animals (Wade et al. 2016) with an unknown population trend. The abundance of humpback whales has increased in Southeast Alaska, though a trend for the Southeast Alaska portion of the MDPS cannot be estimated from the data because of differences in methods and areas covered (Muto et al. 2018).

4.3.1.2 Distribution

Humpback whales migrate seasonally between warmer, tropical or sub-tropical waters in winter months (where they reproduce and give birth to calves) and cooler, temperate or sub-Arctic waters in summer months (where they feed) (see Figure 4). In their summer foraging areas and winter calving areas, humpback whales tend to occupy shallower, coastal waters; during their seasonal migration however, humpback whales disperse widely in deep, pelagic waters and tend to avoid shallower coastal waters (Winn and Reichley 1985).

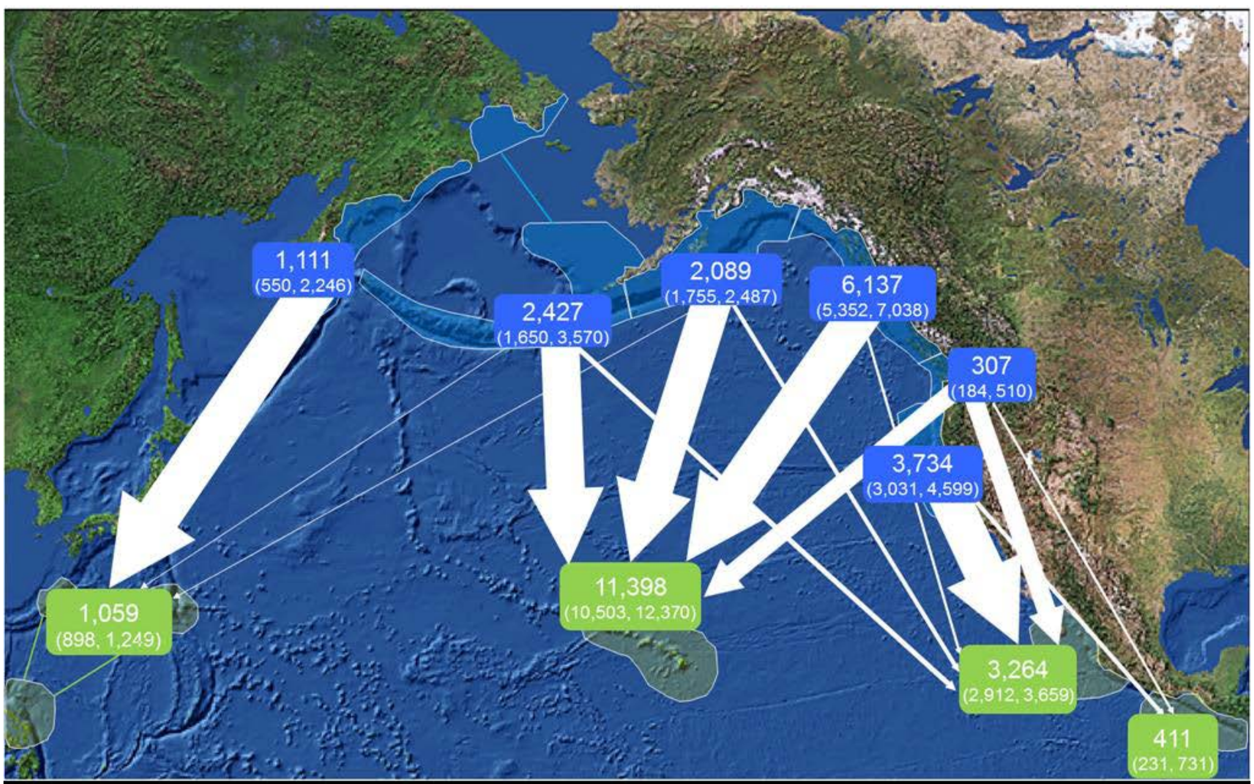

Figure 4. Abundance by summer feeding areas (blue), and winter breeding areas (green), with 95% confidence limits in parentheses. Migratory destinations from feeding area to breeding area are indicated by arrows with width of arrow proportional to the percentage of whales moving into winter breeding area (Wade et al. 2016).

Humpback whale populations in Southeast Alaska have been steadily increasing in recent decades. The Southeast Alaska-specific rate of increase is approximately 5.6% annually (Calambokidis et al. 2008) and the latest estimate of abundance for Southeast Alaska and northern British Columbia is between 3,005 and 6,137 humpback whales, depending on the modeling approach employed. As previously mentioned, humpback whales in Southeast Alaska are 94% comprised of the Hawaii DPS (not listed) and 6% of the MDPS (threatened; Wade et al. 2016). Given Wade et al. (2016), we use 6% in this analysis to approximate the percentage of observed humpbacks in the action area that are from the MDPS. WNP DPS humpback whales are not anticipated to occur in Southeast Alaska (Table 5).

Humpback whales are present in Southeast Alaska in all months of the year. Most humpback whales that spend summers in Southeast Alaska winter in low latitudes, but some individuals have been documented over-wintering near Sitka and Juneau (Moran et al. 2018)). Late fall and winter whale habitat in Southeast Alaska appears to correlate with areas that have over-wintering herring (such as lower Lynn Canal, Tenakee Inlet, Whale Bay, Ketchikan, and Sitka Sound), none of which are in the action area (Baker et al. 1985, Straley 1990). However, the aggregation of some herring in the action area (inner Auke Bay) has the potential to provide a habitat where whales may feed on small volumes of fish and rest to conserve energy between foraging opportunities.

4.3.1.3Threats to the Species

Natural Threats

There is limited information on natural phenomena that kill or injure humpback whales. Humpback whales are killed by orcas (Whitehead and Glass 1985, Dolphin 1987b, Florezgonzalez et al. 1994, Naessig and Lanyon 2004), and are probably killed by false killer whales and sharks. Calves sometimes remain protected near mothers or within a group and lone calves have been known to be protected by presumably unrelated adults when confronted with attack (Ford and Reeves 2008).

Harmful algal blooms are a potential stressor for humpback whales. Out of 13 marine mammal species examined in Alaska, domoic acid was detected in all species examined, with humpback whale showing 38% prevalence. Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50%) and bowhead whales (32%) (Lefebvre et al. 2016). The occurrence of the nematode *Crassicauda boopis* appears to increase the potential for kidney failure in humpback whales and may be preventing some populations from recovering (Lambertsen 1992).

Anthropogenic Threats

Three human activities are known to threaten humpback whales: whaling, entanglement (principally in in commercial fishing gear), and ship strikes.

Whaling

Historically, commercial whaling represented the greatest threat to every population of humpback whales and was ultimately responsible for listing humpback whales as an endangered species. From 1900 to 1965, nearly 30,000 whales were taken in modern whaling operations in the Pacific Ocean. Prior to that, an unknown number of humpback whales were taken (Perry et al. 1999). In 1965, the International Whaling Commission banned commercial hunting of humpback whales in the Pacific Ocean.

There were no reported takes of humpback whales by subsistence hunters in Alaska or Russia for the 2011-2015 period (Muto et al. 2018a). One humpback whale was taken illegally by Alaska Native subsistence hunters near Toksook Bay in western Alaska in 2016, and another was taken illegally in 2006 by hunters near Kotlik, Alaska. While these whales could have been MDPS or WNPDPS humpback whales, they were more likely from the non-listed Hawaii DPS (NMFS unpublished data).

Entanglement

Humpback whales are also killed or injured during interactions with commercial fishing gear and other entanglements, although the evidence available suggests that these interactions may not have significant, adverse consequence for humpback whale populations in Southeast Alaska. From 1979-2008 on the Canadian Atlantic coast, 1,209 whales were recorded entangled, 80% of which were humpback whales (Benjamins et al. 2012). Along the Pacific coast of Canada, 40 humpback whales have been reported as entangled between 1980 and 2011, four of which are known to have died (Ford et al. 2009, COSEWIC (Committee on the Status of Endangered Wildlife in Canada) 2011). A photography study of humpback whales in Southeast Alaska in 2003 and 2004 found at least 53% of individuals showed some kind of scarring from entanglement (Neilson et al. 2005).

The minimum estimate of the mean annual mortality and serious injury rate incidental to U.S. commercial fisheries for the Central North Pacific stock- which includes whales from the Hawaii DPS, Mexico DPS, and Western North Pacific DPS from 2012 to 2016 was 9.9 humpback whales per year, based on 1) observer data from Alaska (0.2 per year in federal fisheries and 5.5 per year in the state-managed Southeast Alaska salmon drift gillnet fishery), 2) observer data from the Hawaii-based deep-set longline (0.9 per year), and 3) the Marine Mammal Authorization Program fishermen self-reports and reports to the NMFS Alaska Region stranding network (3.3 per year) (Muto et al. 2018).

Strandings of humpback whales entangled in fishing gear or with injuries caused by interactions with gear are another source of mortality. The mean annual human-caused mortality and serious injury rate for 2011-2015, based on fishery and gear entanglements reported in the NMFS Alaska Regional Office stranding database, is 0.4 whales per year. The minimum average annual mortality and serious injury rate due to interactions with all fisheries from 2012 to 2016 is 18.5 Central North Pacific humpback whales (9.9 in commercial fisheries , 0.4 in recreational fisheries, 0.5 in subsistence fisheries, 7.7 in unknown fisheries) (Muto et al. 2018).

Entanglements in marine debris reported to the NMFS Alaska Region stranding network account for a minimum mean annual mortality and serious injury rate of 2.6 Central North Pacific humpback whales from 2012 to 2016 (Muto et al. 2018).

Ship Strike

Ship strikes and other interactions with vessels unrelated to fisheries occur frequently with humpback whales (Muto et al. 2018). Neilson et al. (2012) summarized 108 large whale ship-strike events in Alaska from 1978 to 2011, 25 of which are known to have resulted in the whale's death. Eighty-six percent of these reports involved humpback whales. Most ship strikes of humpback whales are reported from Southeast Alaska (Muto et al. 2018).

In 2017, there were seven reported vessel strikes to humpback whales in Alaska (https://alaskafisheries.noaa.gov/sites/default/files/17strandings.pdf). Between 2010 and 2014 the minimum mean annual mortality and serious injury rate due to ship strikes reported in Alaska for humpback whales was 2.7 whales (Muto et al. 2017a). These incidents account for a very small fraction of the total humpback whale population (Laist et al. 2001).

Vessel collisions with humpback whales remain a significant management concern, given the increasing abundance of humpback whales foraging in Alaska, as well as the growing presence of marine traffic in Alaska’s coastal waters. From 2012-2016, there were 21 known vessel strikes of humpback whales (Helker et al. 2019). Based on these factors, injury and mortality of humpback whales as a result of vessel strike will likely continue into the future.

4.3.1.4 Reproduction and Growth

Humpbacks give birth and presumably mate on low-latitude wintering grounds in January to March in the Northern Hemisphere. Females attain sexual maturity at 5 years in some populations and exhibit a mean calving interval of approximately two years (Clapham 1992, Barlow and Clapham 1997). Gestation is about 12 months, and calves probably are weaned by the end of their first year (Perry et al. 1999).

4.3.1.5 Feeding and Prey Selection

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). Feeding by humpback whales is observed most of the year in Auke Bay.

4.3.1.6 Diving and Social Behavior

In Hawaiian waters, humpback whales remain almost exclusively within the 1800 m isobath and usually within water depths less than 182 meters. Maximum diving depths are approximately 170 m (558 ft) (but usually <60 m [197 ft]), with a very deep dive (240 m [787 ft]) recorded off Bermuda (Hamilton et al. 1997). They may remain submerged for up to 21 min (Dolphin 1987a). In Southeast Alaska average dive times were 2.8 min for feeding whales, 3.0 min for non-feeding whales, and 4.3 min for resting whales, with the deepest dives to 148m (Dolphin 1987a), while whales observed feeding on Stellwagen Bank in the North Atlantic dove greater than 40m (Hain et al. 1995). Because most humpback whale prey is likely found above 300m, most humpback dives are probably relatively shallow.

In a review of the social behavior of humpback whales, Clapham (1996) reported that they form small, unstable social groups during the breeding season. During the feeding season they form small groups that occasionally aggregate on concentrations of food. Feeding groups are sometimes stable for long periods of time. There is good evidence of some territoriality on feeding (Clapham 1994, 1996) and calving areas (Tyack 1981).

4.3.1.7 Vocalization and Hearing

While there is no direct data on hearing in low-frequency cetaceans, the functional hearing range is anticipated to be between 7 Hz to 35 kHz (Watkins 1986, Au et al. 2006, Southall et al. 2007a, Ciminello et al. 2012, NMFS 2016b). Baleen whales have inner ears that appear to be specialized for low-frequency hearing. In a study of the morphology of the mysticete auditory apparatus, Ketten (1997) hypothesized that large mysticetes have acute infrasonic hearing.

Humpback whales produce a wide variety of sounds ranging from 20 Hz to 10 kHz. During the breeding season males sing long, complex songs, with frequencies in the 20-5000 Hz range and intensities as high as 181 dB (Payne 1970, Winn et al. 1970, Thompson et al. 1986). Source levels average 155 dB and range from 144 to 174 dB (Thompson et al. 1979). The songs appear to have an effective range of approximately 10 to 20 km. Animals in mating groups produce a variety of sounds (Tyack 1981, Silber 1986b).

Humpback whales produce sounds less frequently in their summer feeding areas. Feeding groups produce distinctive sounds ranging from 20 Hz to 2 kHz, with median durations of 0.2-0.8 seconds and source levels of 175-192 dB (Thompson et al. 1986). These sounds are attractive and appear to rally animals to the feeding activity (D'Vincent et al. 1985, Sharpe and Dill 1997).

In summary, humpback whales produce at least three kinds of sounds:

1. Complex songs with components ranging from at least 20 Hz–24 kHz with estimated source levels from 144– 174 dB; these are mostly sung by males on the breeding grounds (Winn et al. 1970, Richardson et al. 1995, Au et al. 2000, Frazer and Mercado 2000, Au et al. 2006);
2. Social sounds in the breeding areas that extend from 50Hz – more than 10 kHz with most energy below 3kHz (Tyack and Whitehead 1983, Richardson et al. 1995); and
3. Feeding area vocalizations that are less frequent, but tend to be 20 Hz–2 kHz with estimated sources levels in excess of 175 dB re 1 Pa at 1m (Thompson et al. 1986, Richardson et al. 1995).

4.3.1 Status of WDPS Steller Sea Lions

4.3.2.1 Population Structure and Status

In the 1950s, the worldwide abundance of Steller sea lions was estimated at 240,000 to 300,000 animals, with a range that stretched across the Pacific Rim from southern California, Canada, Alaska, and into Russia and northern Japan. In the 1980s, annual rates of decline in the range of what is now recognized as the western population were as high as 15 percent. The worldwide Steller sea lion population declined by over 50 percent in the 1980s, to approximately 116,000 animals (Loughlin 1992). By 1990, the U.S. portion of the population had declined by about 80 percent relative to the 1950s. On April 5, 1990, NMFS issued an emergency interim rule to list the Steller sea lion as threatened (55 FR 12645). On November 26, 1990, NMFS issued the final rule to list Steller sea lions as a threatened species under the ESA (55 FR 49204).

NMFS reclassified Steller sea lions as two distinct population segments under the ESA in 1997 based on demographic and genetic dissimilarities—the western and eastern stock (62 FR 24345, (NMFS 1997). At that time, the WDPS, extending from Japan around the Pacific Rim to Cape Suckling in Alaska (144° W; Figure 5), was listed as endangered due to its continued decline and lack of recovery (NMFS 1997).

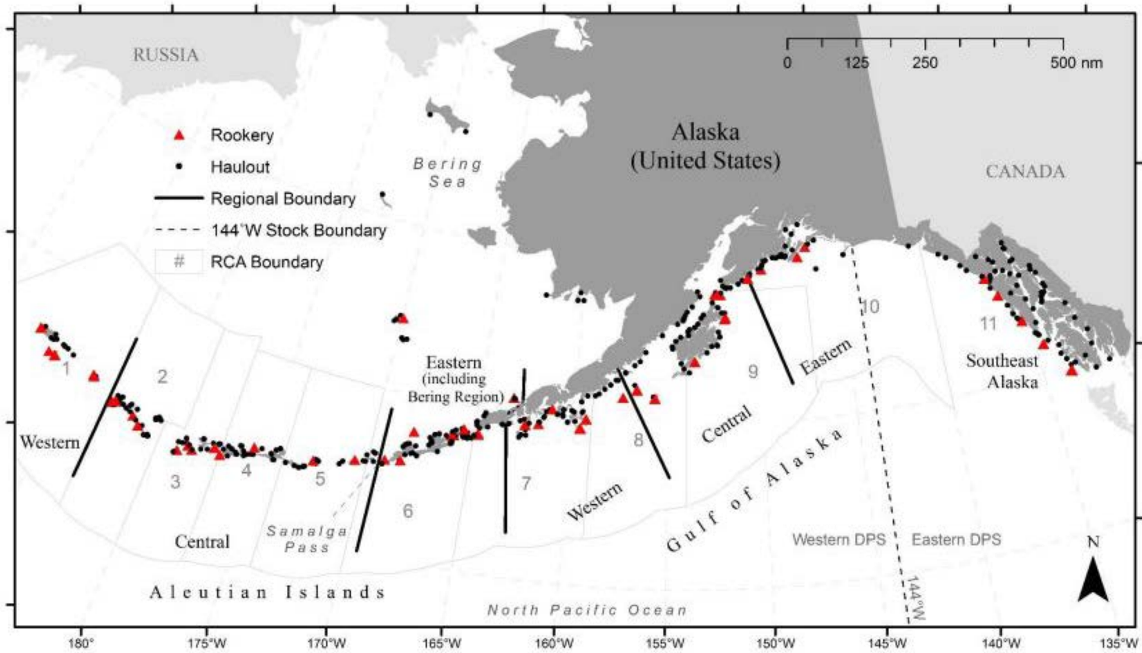

Figure 5. Map of Alaska showing the NMFS Steller sea lion survey regions, rookery, and haulout locations. The line (144°W) separating primary breeding rookeries of the eastern and western distinct population segments (EDPS vs WDPS) is also shown (Fritz et al. 2016).

The eastern Distinct Population Segment (EDPS), extending from Cape Suckling (144° W) east to British Columbia and south to California, was listed as threatened because of concern over WDPS animals ranging into the east, the larger decline overall in the U.S. population, human interactions, and the lack of recovery in California (NMFS 1997). The EDPS continued to recover, however, and NMFS removed the EDPS from the list of threatened species on November 4, 2013 (78 FR 66140, NMFS 2013), since the recovery criteria in the Steller Sea Lion Recovery Plan (NMFS 2008b) were achieved and the stock no longer met the definition of a threatened species under the ESA. Because the EDPS is no longer listed under the ESA, this Opinion does not analyze effects of the proposed action on that DPS.

In Alaska, the observed population decline spread and intensified east and west of the eastern Aleutians in the 1980s. Between 1991 and 2000, overall counts of Steller sea lions at trend sites decreased 40%, an average annual decline of 5.4% (Loughlin and York 2000). In the 1990s, counts decreased more at the western (western Aleutians: -65%) and eastern edges (eastern and central GOA: -56% and -42%, respectively) of the U.S. range than they did in the center (range of -24% to -6% from the central Aleutians through the western Gulf of Alaska (Fritz et al. 2008). The decline continued in the WDPS until about 2000.

More recently, WDPS Steller sea lions have shown an increasing trend in abundance in much of their range. The 2016 Stock Assessment Report for WDPS Steller sea lions indicates a minimum population estimate of 50,983 individuals (Muto et al. 2017b). The population trend of non-pup WDPS Steller sea lions from 2000-2014 varies regionally, from -8.71 percent per year in the Western Aleutians to +5.07 percent per year in the eastern Gulf of Alaska. Despite incomplete surveys conducted in 2006 and 2007, the available data indicate that overall WDPS Steller sea lions have at least been stable since 2004 (when the last complete assessment was done), although stark declines continue in the western Aleutian Islands. Overall, WDPS Steller sea lion pup and non-pups counts were estimated to be increasing at about 2 percent per year from 2000-2015 (Muto et al. 2017b).

4.3.2.2 Distribution

Movement of Steller sea lions between the WDPS and EDPS may affect population dynamics and patterns of underlying genetic variation. Studies have confirmed movement of animals across the 144° W boundary (Fritz et al. 2013), (Jemison et al. 2013), (Pitcher et al. 2007), and (Raum-Suryan et al. 2002). Jemison et al (2013) found regularly occurring temporary movements of WDPS Steller sea lions across the 144 W longitude boundary, and some WDPS females have given birth at White Sisters and Graves Rocks rookeries and have likely emigrated permanently. The vast majority of these sightings have been in northern Southeast Alaska, north of Frederick Sound. Fritz et al (2013) estimated an average annual breeding season movement of WDPS Steller sea lions to southeast Alaska of 917 animals.

Within the action area, Steller sea lions are anticipated to be predominantly from the EDPS; however, WDPS animals may be found there as well. Although there are no known Steller sea lion haulouts or rookeries in the action area, the Benjamin Island haulout (30 kilometers northwest of the action area) and Little Island (28 kilometers northwest of the action area) in the Lynn Canal are likely the predominant haulouts used by the Steller sea lions that are found transiting into and out of the action area. Previously, NMFS has used the value of 2% as the proportion of WDPS Steller sea lions occurring in southeast Alaska based on 280 unique branded individuals that were documented at the Benjamin Island haulout from 2000 to 2018. However, recent work by Hastings et al. (2019) used a combination of mitochondrial DNA haplotypes and resighting data of branded individuals to estimate the proportion of WDPS Steller sea lions at haul-out locations in the Lynn Canal. They defined a mixing zone within the eastern stock region where there is significant mixing of animals born in both the western and eastern stock regions. At the Graves Rocks and White Sisters rookeries within this mixing zone, pups were marked and DNA was extracted from skin samples to determine if the animal's haplotype indicated that it was of eastern or western stock lineage. They found that 16.7% of non-pup sea lions at haul-out locations in the Lynn Canal were from the mixing zone and had western stock haplotypes. In addition, 1.4% were WDPS Steller sea lions based on resightings of branded individuals for a total of 18.1% of sea lions being of the WDPS Steller sea lion population. Therefore, for purposes of this analysis, NMFS will assume that 18.1% of the Steller sea lions in the action area are from the endangered WDPS and the remaining 81.9% are from the delisted EDPS.

4.3.2.3 Threats to the Species

Brief descriptions of threats to Steller sea lions follow. More detailed information can be found in the Steller sea lion Recovery Plan (available at:

http://alaskafisheries.noaa.gov/protectedresources/stellers/recovery/sslrpfinalrev030408.pdf), the Stock Assessment Reports (available at: http://www.nmfs.noaa.gov/pr/sars/species.htm), and the most recent Alaska Groundfish Biological Opinion (NMFS 2014a).

Natural Threats

Killer Whale Predation

The Steller Sea Lion Recovery Plan (NMFS 2008b) ranked predation by killer whales as a potentially high threat to the recovery of the WDPS. Steller sea lions in both the eastern and western stocks are eaten by killer whales (Dahlheim and White 2010).

Relative to other WDPS sub-regions, transient killer whale abundance and predation on Steller sea lions has been well studied in the Prince William Sound and Kenai Fjords portion of the eastern GOA. Steller sea lions represented 33% and 5% of the remains found in deceased killer whale stomachs in the GOA, depending on the specific study results (Heise et al. 2003). The abundance of transient killer whales in the eastern GOA was estimated to be 18 (Matkin et al. 2012). Nineteen transient killer whales were identified in Kenai Fjords from 2000 through 2005 and killer whale predation on six pup and three juvenile Steller sea lions was observed. It has been estimated that 11% of the Steller sea lion pups born at the Chiswell Island rookery (in the Kenai Fjords area) were preyed upon by killer whales from 2000 through 2005. GOA transient killer whales were concluded to have a minor impact on the recovery of the sea lions in the area (Maniscalco et al. 2007). Steller sea lion pup mortality was studied using remote video at Chiswell Island. Pup mortality up to 2.5 months postpartum averaged 15.4%, with causes varying greatly across years (2001–2007). They noted that high surf conditions and killer whale predation accounted for over half the mortalities. Even at this level of pup mortality, the Chiswell Island Steller sea lion population has increased (Maniscalco et al. 2008).

Other studies in the Kenai Fjords/Prince William Sound region have also found evidence for high levels of juvenile Steller sea lion mortality. Based on data collected post-mortem from juvenile Steller sea lions implanted with life history tags, 12 of 36 juvenile Steller sea lions were confirmed dead, at least 11 of which were likely killed by predators (Horning and Mellish 2012). Horning and Mellish (2012) estimated that over half of juvenile Steller sea lions in this region are consumed by predators before age 4 yr. They suggested that low juvenile survival due to predation, rather than low natality, may be the primary impediment to recovery of the WDPS of Steller sea lions in the Kenai Fjords/Prince William Sound region.

Shark Predation

Steller sea lions may also be attacked by sharks, though little supporting evidence exists. The Steller Sea Lion Recovery Plan did not rank shark predation as a threat to the recovery of the WDPS (NMFS 2008b). Sleeper shark and sea lion home ranges overlap (Hulbert et al. 2006). A significant increase in the relative abundance of sleeper sharks occurred during 1989–2000 in the central GOA; however, samples of 198 sleeper shark stomachs found no evidence of Steller sea lion predation (Sigler et al. 2006). Sigler et al. (2006) sampled sleeper shark stomachs collected in the GOA near sea lion rookeries when pups may be most vulnerable to predation (i.e., first water entrance and weaning) and found that fish and cephalopods were the dominant prey. Tissues of marine mammals were found in 15 percent of the shark stomachs, but no Steller sea lion tissues were detected (Sigler et al. 2006). One study suggests that predation on Steller sea lions by sleeper sharks may be occurring: approximately 27% of observed events of predation on juvenile Steller sea lions could be attributed to Pacific sleeper sharks. Although these observations do not constitute proof of attacks on live Steller sea lions by Pacific sleeper sharks, these data indicate that Pacific sleeper sharks could be considered as a possible source of mortality of juvenile Steller sea lions in the GOA and Prince William Sound (Horning 2014).

Disease and Parasites
The Steller Sea Lion Recovery Plan (NMFS 2008b) ranked diseases and parasites as a low threat to the recovery of the WDPS. There is no new information on disease in the WDPS relative to the information in the biological opinion for the Fishery Management Plan (FMP) for the Gulf of Alaska (NMFS 2010).

Environmental Variability and Drivers in the Bering Sea and Gulf of Alaska/North Pacific
The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the WDPS (NMFS 2008b). The Bering Sea and Gulf of Alaska are subjected to large-scale forcing mechanisms that can lead to basin-wide shifts in the marine ecosystem resulting in significant changes to physical and biological characteristics, including sea surface temperature, salinity, and sea ice extent and amount. Physical forcing affects food availability and can change the structure of trophic relationships by impacting climate conditions that influence reproduction, survival, distribution, and predator-prey relationships at all trophic levels (Wiese et al. 2012). Populations of Steller sea lions in the GOA and Bering Sea have experienced large fluctuations due to environmental and anthropogenic forcing (Mueter et al. 2009b). As we work to understand how these mechanisms affect various trophic levels in the marine ecosystem, we must consider the additional effects of global warming, which are expected to be most significant at northern latitudes (IPCC 2013b).

<u>Anthropogenic Threats</u>

Fishing Gear and Marine Debris Entanglement
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the WDPS. Helker et al. (2016) report 352 cases of serious injuries to EDPS Steller sea lions from interactions with fishing gear between 2009 and 2013, mostly from troll gear and other marine debris. Raum-Suryan et al. (2009) found 386 animals either entangled in marine debris or having ingested fishing gear over the period 2000-2007 in Southeast Alaska and northern British Columbia.

The estimated mean annual mortality and serious injury rate in U.S. commercial fisheries in 2011-2015 is 31 Steller sea lions from the WDPS (31 from observer data + 0.2 from stranding data). No observers have been assigned to several fisheries that are known to interact with WDPS Steller sea lions; thus, the estimated mortality and serious injury is likely an underestimate of the actual level (Muto et al. 2018).

Competition between Commercial Fishing and Steller Sea Lions for Prey Species
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked competition with fisheries for prey as a potentially high threat to the recovery of the WDPS. Substantial scientific debate surrounds the question about the impact of potential competition between fisheries and Steller sea lions. It is generally well accepted that commercial fisheries target several important Steller sea lion prey

species (NRC 2003) including salmon species, Pacific cod, Atka mackerel, pollock, and others. These fisheries could be reducing sea lion prey biomass and quality at regional and/or local spatial and temporal scales such that sea lion survival and reproduction are reduced (NMFS 2014a).

Subsistence/Native Harvest
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked subsistence harvest as a low threat to the recovery of the WDPS. The most recent subsistence harvest data were collected by the Alaska Department of Fish and Game through 2008 and by the Ecosystem Conservation Office of the Aleut Community of St. Paul through 2009. The mean annual subsistence take from the WDPS in Alaska over the 5-year period from 2004 through 2008, combined with the mean take over the 2005–2009 period from St. Paul, was 199 Steller sea lions/year (Muto et al. 2018a).

Illegal Shooting
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked illegal shooting as a low threat to the recovery of the WDPS. Illegal shooting of sea lions was thought to be a potentially significant source of mortality prior to the listing of sea lions as threatened under the ESA in 1990. The NMFS Alaska Stranding Program documents 60 Steller sea lions with suspected or confirmed firearm injuries from 2000 – 2016 in Southeast Alaska (NMFS 2017).

On November 6, 2018, two Cordova, Alaska men were sentenced in federal court for harassing and killing Steller sea lions with shotguns. The sentencing came as the result of a federal investigation after 15 Steller sea lions were found dead along the sand bars at the mouth of Copper River during the opening of the 2015 Copper River salmon gillnet season.

Mortality and Disturbance from Research Activities
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked effects from research activities as a low threat to the recovery of the WDPS. Mortalities may occur incidental to marine mammal research activities authorized under ESA and MMPA permits issued to a variety of government, academic, and other research organizations. Between 2011 and 2015, there were three mortalities resulting from research on the WDPS of Steller sea lions (Muto et al 2018).

Vessel Disturbance
Vessel traffic, in the form of sea lion research, tourism, and other marine vessel traffic, may disrupt sea lion feeding, breeding, or aspects of sea lion behavior. The Steller Sea Lion Recovery Plan (NMFS 2008) ranked disturbance from these sources as a low threat to the recovery of the WDPS. Disturbance from these sources are not likely having population level effects in the WDPS.

Risk of Vessel Strike
NMFS Alaska Region Stranding Program has records of at least four occurrences of Steller sea lions being struck by vessels in Southeast Alaska; three were near Sitka, one was south of Juneau. Vessel strike is not considered a major threat to Steller sea lions.

Toxic Substances
The Steller Sea Lion Recovery Plan ranked the threat of toxic substances as medium (NMFS 2008). The risk of spills associated with this project is being well-mitigated, and sediment testing

for this project indicates contaminant levels are below thresholds of concern (PND Engineers 2019b).

Climate Change and Ocean Acidification

Marine ecosystems are susceptible to impacts from climate change and ocean acidification linked to increasing global anthropogenic CO_2 emissions. As discussed in the Groundfish Fisheries Management Plan Opinion (FMP)(NMFS 2010), there is strong evidence that ocean pH is decreasing, ocean temperatures are increasing, and that this warming is accentuated in the Arctic. Scientists are working to understand the impacts of these changes to marine ecosystems; however, the extent and timescale over which WDPS Steller sea lions may be affected by these changes is unknown. Readers are referred to the discussion on climate change in Section 4.1.6 of the Groundfish FMP Opinion (NMFS 2010) and to the discussion on ocean acidification in Section 7.3 of the Final Environmental Impact Statement for the Steller sea lion protection measures (NMFS 2014b).

4.3.2.4 Reproduction and Growth

Detectable changes in a population's birth rate may provide insight into the nature of the factors controlling Steller sea lion population dynamics. While this has been broadly recognized and the focus of many studies, few empirical data exist to directly infer birth rate in wild Steller sea lions. The best data for inferring WDPS Steller sea lion birth rates are available for the central Gulf of Alaska (GOA) where collections from the 1970s and 1980s provide direct measurements and a basis for comparing birth rates in the central GOA over time. The numerous models developed from these historic collections yield generally consistent results: the decline of Steller sea lions in the central GOA in the 1980s was driven by low juvenile survival and the continued decline in the 1990s was likely driven by reduced birth rate.

Several models have demonstrated the relevance of spatial heterogeneity in vital rates (birth rate, death rate, population growth rate) among subpopulations in the WDPS of Steller sea lion. As such, vital rates from one Steller sea lion subpopulation may not be applicable to another, especially where the rate and direction of population growth diverge. Another common conclusion from the age-structured modeling studies is that the fraction of juveniles in the non-pup counts is an important variable for inferring changes in vital rates over time (Muto et al. 2017b). Many studies have concluded that the available count data do not provide insight into the relative contribution of survival and birth rate in current Steller sea lion population trends. However, Holmes et al. (Holmes 2007) included information on changes in the juvenile fraction of the population to help estimate vital rate changes in the central GOA sea lion population. This information improves the ability to estimate vital rate changes in the absence of sightings of known–age individuals.

The best available data from the eastern GOA suggest that the current birth rate is similar to pre-decline birth rates, while the best available data from the central GOA suggest that the birth rate continues to decline steadily relative to 1976 levels. Therefore, birth rate, an important parameter driving population trends, is not consistent across the WDPS and is highest in the eastern portion of the WDPS Steller sea lion range (Muto et al. 2017b).

4.3.2.5 Feeding and Prey Selection

Steller sea lions consume a variety of demersal, semi-demersal, and pelagic prey, indicating a potentially broad spectrum of foraging styles, probably based primarily on availability. Overall, the available data suggest two types of distribution at sea by Steller sea lions: 1) less than 20 km (12 mi) from rookeries and haulout sites for pups, juveniles, and adult females with pups, and 2) much larger areas (greater than 20 km [12 mi]) where these and other Steller sea lions may range to find optimal foraging conditions once they are no longer tied to rookeries and haulout sites for nursing and reproduction. Large seasonal differences in foraging ranges have been observed associated with seasonal movements of prey (Merrick et al. 1997).

The seasonal ecology of Steller sea lions in Southeast Alaska has been studied by relating the distribution of sea lions to prey availability (Womble et al. 2005, Womble et al. 2009). Figure 6 depicts a likely seasonal foraging strategy for Steller sea lions in Southeast Alaska. These results suggest that seasonally aggregated high-energy prey species, such as eulachon and herring in late spring and salmon in summer and fall, influence the seasonal distribution of Steller sea lions in some areas of Southeast Alaska. Similarly, the Status Review of Southeast Alaska Pacific Herring (NMFS 2014c) generalizes that sea lions forage on herring aggregations in winter, on spawning herring and eulachon in spring, and on various other species throughout the year. Herring fishery managers use the presence of sea lions on the spring spawning grounds as an indicator that spawning is imminent, even though herring are in deeper adjacent waters for weeks prior to sea lion arrival (Kruse 2000).

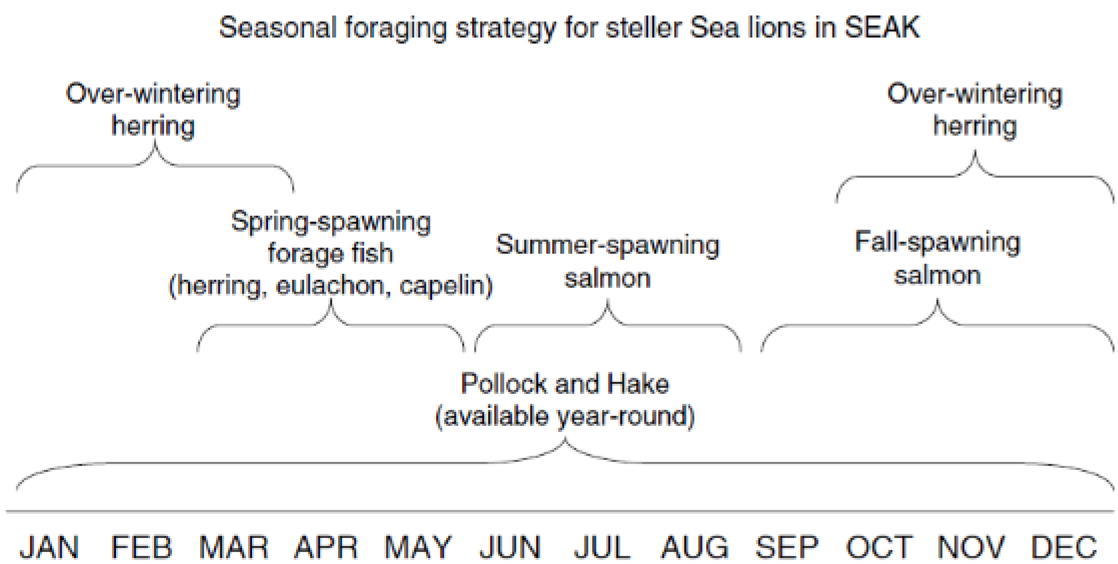

Figure 6. Seasonal foraging ecology of SSL. Reproduced with permission from Womble et al. 2009.

The action area and surrounding waters contain abundant sources of prey species, which draw Steller sea lions in to forage year-round.

4.3.2.6 Diving and Social Behavior

Steller sea lions are very vocal marine mammals. Roaring males often bob their heads up and down when vocalizing. Adult males have been observed aggressively defending territories. Steller sea lions gather on haulouts year-round and rookeries during the breeding season and regularly travel as far as 250 miles to forage for seasonal prey. However, females with pups likely forage much closer to their rookery. Diving is generally to depths of 600 feet or less and diving duration is usually 2 minutes or less.

4.3.2.7 Vocalization and Hearing

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 2016b). Steller sea lions have similar hearing thresholds in-air and underwater to other otariids. In-air hearing ranges from 0.250-30 kHz, with their best hearing sensitivity at 5-14.1 kHz (Mulsow and Reichmuth 2010). An underwater audiogram shows the typical mammalian U-shape. Higher hearing thresholds, indicating poorer sensitivity, were observed for signals below 16 kHz and above 25 kHz (Kastelein et al. 2005).

5. ENVIRONMENTAL BASELINE

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

5.1 Stressors on Mexico DPS Humpback Whales

Disturbance and risk of vessel strike from transiting vessels, competition for prey, effects from climate change, risk of entanglement, and the risk of oil spills (or other hazardous materials) could be sources of stress to humpback whales in the action area. A short description and summary of the effects of these stressors are presented below. More detailed analyses are available in the humpback whale recovery plan (NMFS 1991b) and ESA Status Review (Bettridge et al. 2015).

5.1.1 Vessel Disturbance and Strike

Vessel-based recreational activities, commercial fishing, shipping, whale-watching, the Alaska Marine Highway System (AMHS), and general transportation occur within the action area regularly. All of these sources of vessel traffic increase underwater noise and contribute to the risk of vessel-whale collisions.

Vessel strikes are a leading cause of mortality in large whales. Neilson et al. (2012) reported the following summary statements about humpback whale and vessel collisions in Southeast Alaska.

- Most vessels that strike whales are less than 49 ft long

- Most collisions occur at speeds over 13 knots
- Most collisions occur between May and September
- Calves and juveniles appear to be at higher risk of collisions than adult whales

Further, the authors used previous locations of whale strikes to produce a kernel density estimation. The high risk areas shown in red in Figure 7 are also popular whale-watching destinations (Neilson et al. 2012). Although some of the risk factors for ship strike exist in Auke Bay (there are many vessel transits between May and September, with vessels less than 49 feet traveling over 13 knots), the action area is not identified as an area of high risk in this analysis.

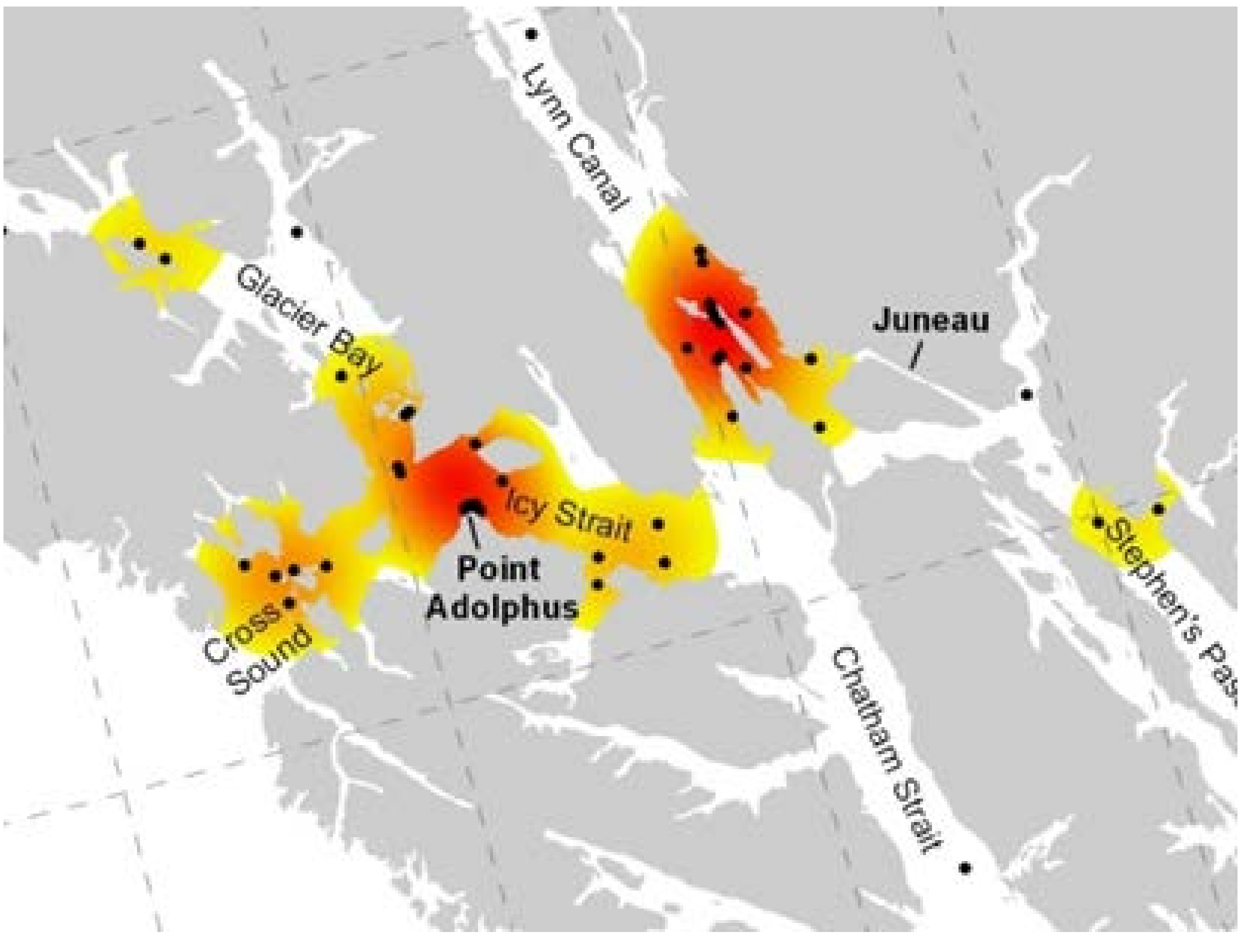

Figure 7. High Risk Areas for Vessel Strike in northern Southeast Alaska. Used with permission from (Neilson et al. 2012).

NMFS implemented regulations to minimize harmful interactions between ships and humpback whales in Alaska (see 50 CFR §§ 216.18, 223.214, and 224.103(b)). These regulations require that all vessels:

a. Not approach within 100 yards of a humpback whale, or cause a vessel or other object to approach within 100 yards of a humpback whale,

b. Not place vessel in the path of oncoming humpback whales causing them to surface within 100 yards of vessel,

c. Not disrupt the normal behavior or prior activity of a whale, and
d. Operate vessel at a slow, safe speed when near a humpback whale. Safe speed is defined in regulation (see 33 CFR § 83.06).

Since 2011, cruise lines, pilots, NMFS, and National Park Service (NPS) biologists have worked together to produce weekly whale sightings maps to improve situational awareness for cruise ships and state ferries in Southeast Alaska. In 2016, NMFS and NPS launched Whale Alert, a voluntary program that receives and shares real-time whale sightings with controlled access to reduce the risk of ship strike and contribute to whale avoidance.

In addition, many of the marine mammal viewing tour boats participate in the Whale SENSE program. NMFS implemented Whale SENSE Alaska in 2015, which is a voluntary program developed in collaboration with the whale-watching industry that recognizes companies who commit to responsible practices. More information is available at https://whalesense.org/.

5.1.2 Competition for Prey

Competition for prey between humpback whales, other marine life, and humans may exist. Humpback whales feed on schooling fish, including species that are harvested by humans commercially or for personal use. However, given the relatively small scale of the action area compared to commercial and personal use fishing grounds, its unlikely competition for prey is a measurable stressor for listed species.

5.1.3 Climate Change

Overwhelming data indicate the planet is warming (IPCC 2014), which poses a threat to most Arctic and Subarctic marine mammals.

Climate change has the potential to impact species abundance, geographic distribution, migration patterns, timing of seasonal activities (IPCC 2014), and species viability into the future. Climate change is also expected to result in the expansion of low oxygen zones in the marine environment (Gilly et al. 2013). Though predicting the precise consequences of climate change on highly mobile marine species, such as many of those considered in this opinion, is difficult (Simmonds and Isaac 2007), recent research has indicated a range of consequences already occurring.

The indirect effects of climate change would result from changes in the distribution of temperatures suitable for the distribution and abundance of prey and the distribution and abundance of competitors or predators. For example, variations in the localized recruitment of herring in or near the action area caused by climate change could change the distribution and localized abundance of humpback whales. However, we have no information to indicate that this has happened to date. Warmer waters could favor productivity of some species of forage fish, but the impact on recruitment of important prey fish of humpback whales is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years, but the distribution and recruitment of other fish (e.g., osmerids) could be negatively affected (NMFS 2008a, b).

5.1.4 Entanglement

Entanglement of cetaceans in fishing gear and other human-made material is a major threat to their survival worldwide. Other materials also pose entanglement risks including marine debris, mooring lines, anchor lines, and underwater cables. While in many instances, marine mammals may be able to disentangle themselves (see Jensen et al. 2009), other entanglements result in lethal and sublethal trauma to marine mammals including drowning, injury, reduced foraging, reduced fitness, and increased energy expenditure (van der Hoop et al. 2016).

Entangled marine mammals may drown or starve due to being restricted by gear, suffer physical trauma and systemic infections, or be hit by vessels due to an inability to avoid them. Entanglement can include many different gear interaction scenarios, but the following have occurred with humpback whales:

- Gear loosely wrapped around the marine mammal's body that moves or shifts freely with the marine mammal's movement and does not indent the skin can result in disfigurement.
- Gear that encircles any body part and has sufficient tension to either indent the skin or to not shift with marine mammal's movement can cause lacerations, partial or complete fin amputation, organ damage, or muscle damage and interfere with mobility, feeding, and breathing. Chronic tissue damage from line tension can compromise a whale's physiology. Fecal samples from entangled whales had extremely high levels of cortisols (Rolland et al. 2005), an immune system hormone. Extended periods of pituitary release of cortisols can exhaust the immune system, making a whale susceptible to disease and infection.

The NMFS Alaska Marine Mammal Stranding Network database has records of 199 large whale entanglements between 1990 and 2016. Of these, 67% were humpback whales. Most humpbacks get entangled with gear between the beginning of June and the beginning of September, when they are on their nearshore foraging grounds in Alaska waters. Between 1990 and 2016, 29% of humpback entanglements were with pot gear and 37% with gillnet gear. Longline gear comprised only 1–2% of all humpback fishing gear interactions.

5.1.5 Pollution

A number of intentional and accidental discharges of contaminants pollute the marine waters of Alaska annually. Intentional sources of pollution, including domestic, municipal, and industrial wastewater discharges, are managed and permitted by the Alaska Department of Environmental Conservation (ADEC). Pollution may also occur from unintentional discharges and spills.

According to the ADEC's most recent list of impaired waterbodies, there are no impaired waterbodies in the action area[1]. However, marine water quality in the action area can be affected by discharges from shipyard and other industrial activity, treated sewer system outflows, vessels operating in marine waters, and sediment runoff from paved surfaces and disturbed areas (HDR

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[1] ADEC. Division of Water. Impaired Waters Map. Available at http://www.arcgis.com/home/webmap/viewer.html?webmap=5987f5c7a33846b19b9097dddcf8332a accessed December 2018.

2017).

A search of the ADEC Contaminated sites database[2] showed that there are four land-based active contaminated sites in the vicinity of Auke Bay. These include the FAA Coghlan Island station site (Hazard ID 4176); a failed 550-gallon underground home heating oil tank (Hazard ID 4536); the Glacier Highway Battery Dump Site (Hazard ID 4636); and the Auke Bay RV Park (Hazard ID 26824). Clean-up is in progress at the four sites.

5.1.6 Natural and Anthropogenic Noise

ESA-listed species in the action area are exposed to several sources of natural (physical and biological) and anthropogenic noise. Ambient noise is background noise that is composed of many sources from multiple locations (Richardson et al. 1995). In general, ambient noise levels in the marine environment are variable over time due to a number of biological, physical, and anthropogenic sources. Ambient noise can vary with location, time of day, tide, weather, season, and frequency on scales ranging from a second to a year.

Underwater sound levels in the action area include physical noise, biological noise, and anthropogenic noise. Physical noise includes waves at the water surface, rain, currents, moving rock, sediments and silts, and atmospheric noise. Biological sound includes vocalizations produced by marine mammals, fishes, seabirds, and invertebrates. Anthropogenic noise may include vessels (small and large), shore-based processing plants, marine fueling facilities, ferry and barge cargo loading/unloading operations, maintenance dredging, aircraft overflights, construction noise (drilling, pile-driving), and other sources, which produce varying noise levels and frequency ranges. The combination of anthropogenic and natural noises contributes to the total noise at any one place and time.

The area around Auke Bay and the Erickson dock are frequented by fishing vessels and tenders; occasional barges; and other recreational vessels. High levels of vessel traffic are known to elevate background levels of noise in the marine environment. For example, continuous noise from tugboats pulling barges has been reported to range from 145 to 166 dB rms referenced to 1 microPascal (re 1 μPa) at 1 meter from the source.

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. (2009a) 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 (Parks 2003, McDonald et al. 2006, 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.

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[2] ADEC. Division of Spill Prevention and Response. Contaminated Sites Map. Available at http://www.arcgis.com/home/webmap/viewer.html?webmap=315240bfbaf84aa0b8272ad1cef3cad3&center=-131.656975,55.344914&level=15&marker=-131.656975,55.344914,,Click%20on%20arrow%20to%20get%20information%20about%20this%20site accessed December 2018.

Noise Related to Construction Activities
NMFS is conducting another ESA section 7 consultation related to construction activities in Auke Bay for improvements to Statter Harbor. This consultation will likely authorize the take (by harassment) of humpback whales from sounds produced during pile driving, drilling, dredging, blasting and vessel operations. The incidental take statements proposes an estimated nine Mexico DPS humpback whales, total, would be taken (by Level B harassment) as a result of exposure to continuous sounds at received levels at or above 120 dB re 1 µPa rms and impulsive sounds at received levels at or above 160 dB re 1 µPa rms. No Level A harassment of a MDPS humpback whales is likely to be authorized.

Anticipated impacts by harassment from noise associated with construction activities generally include changes in behavioral state from low energy states (i.e., foraging, resting, and milling) to high energy states (i.e., traveling and avoidance).

5.1.7 Subsistence Harvest

The ESA and MMPA allow for the harvest of marine mammals by Alaska Natives for subsistence purposes and for traditional handicrafts. Except for 11 Arctic villages that have International Whaling Commission-issued quota for harvest of bowhead whales, subsistence hunters in Alaska are not authorized to take large whales (Muto et al. 2018a). However, one humpback whale was illegally harvested in Kotlik in October, 2006, and another was illegally harvested in Toksook Bay in May, 2016, while a gray whale was illegally harvested in the Kuskokwim River in July, 2017. Low levels of unreported gray and minke whale subsistence harvest likely occur elsewhere in remote rural Alaska.

5.2 Stressors on WDPS Steller Sea Lions

Disturbance from vessel transit, competition for prey, effects from climate change, risk of entanglement, and the risk of oil spills (or other hazardous materials) could be sources of stress to Steller sea lions in the action area. Short descriptions and summaries of the effects of these stressors are presented below. A more detailed analysis is available in a recent biological Opinion of the effects of Alaska Groundfish fisheries (NMFS 2014a) and the SSL recovery plan (NMFS 2008).

5.2.1 Vessel Disturbance and Strike

Vessel-based recreational activities, commercial and charter fishing, shipping, and general transportation occur within the action area regularly, all of which increase ambient in-air and underwater noise and pose risk of vessel-whale collisions. NMFS provides a voluntary framework for vessel operators to follow a code of conduct to reduce marine mammal interactions including:

- remain at least 100 yards from marine mammals,
- time spent observing individual(s) should be limited to 30 minutes, and
- vessels should leave the vicinity if they observe Steller sea lion behaviors such as these:

- o Increased movements away from the disturbance, hurried entry into the water by many animals, or herd movement towards the water; or
- o Increased vocalization, aggressive behavior by many animals towards the disturbance, or several individuals raising their heads simultaneously.

These guidelines can be viewed at https://alaskafisheries.noaa.gov/pr/mm-viewing-guide.

Although there are documented occurrences of Steller sea lions being struck by vessels in Southeast Alaska (see Section 4.3.2), vessel strike has not been documented in the action area and is not considered a major threat to Steller sea lions.

5.2.2 Competition for Prey

Competition for prey species could exist between Steller sea lions and other marine life and Steller sea lions and commercial fishing. NMFS (2008) noted there are commercial fisheries that target key Steller sea lion prey, including Pacific cod, salmon, and herring in the eastern portion of their range. It was recognized that in some regions, fishery management measures appear to have reduced this potential competition (e.g., no trawl zones and gear restrictions on various fisheries in southeast Alaska) and in others a very broad distribution of prey and a lack of seasonal overlap between fisheries and prey preference by sea lions may minimize competition as well. Given the recent abundance trends discussed above in Section 4.3.2 and the relatively small scale of the action area compared to nearby fishing grounds, NMFS expects any competition for prey in the action area to be insignificant.

5.2.3 Climate Change

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the western DPS (NMFS 2008). The Bering Sea and Gulf of Alaska are subjected to large-scale forcing mechanisms that can lead to basin-wide shifts in the marine ecosystem resulting in significant changes to physical and biological characteristics, including sea surface temperature, salinity, and sea ice extent and amount. Physical forcing affects food availability and can change the structure of trophic relationships by impacting climate conditions that influence reproduction, survival, distribution, and predator-prey relationships at all trophic levels in or near the action area. Populations of Steller sea lions in the Gulf of Alaska and Bering Sea have experienced large fluctuations due to environmental and anthropogenic forcing (Mueter et al. 2009). As we work to understand how these mechanisms affect various trophic levels in the marine ecosystem, we must consider the additional effects of global warming, which are expected to be most significant at northern latitudes (Mueter et al. 2009a, IPCC 2013a).

The effects of climate changes to the marine ecosystems of the Gulf of Alaska, including Lynn Canal, and how they may affect Steller sea lions are uncertain. Warmer waters could favor productivity of some species of forage fish, but the impact on recruitment of important prey fish of Steller sea lions is unpredictable. Recruitment of large year-classes of gadids (e.g., pollock) and herring has occurred more often in warm than cool years, but the distribution and recruitment of other fish (e.g., osmerids) could be negatively affected (NMFS 2008).

5.2.4 Entanglement

Although the Steller Sea Lion Recovery Plan (NMFS 2008b) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the western DPS, it is likely that many entangled sea lions may be unable to swim to shore once entangled, may die at sea, and may not be available to count (Loughlin 1986, Raum-Suryan et al. 2009). Based on data collected by ADF&G and NMFS, Helker et al. (2016) reported Steller sea lions to be the most common species of human-caused mortality and serious injury between 2011 and 2015. There were 468 cases of serious injuries to eastern DPS Steller sea lions from interactions with fishing gear and marine debris. While these cases are attributed to the eastern DPS because they occurred east of 144° W, eastern and western DPS animals overlap in Southeast Alaska, and some of these takes may have been western DPS animals. Raum-Suryan et al. (2009) observed a minimum of 386 animals either entangled in marine debris or having ingested fishing gear over the period 2000-2007 in Southeast Alaska and northern British Columbia

The minimum estimate of the mean annual mortality and serious injury rate incidental to U.S. commercial fisheries for WDPS Steller sea lions in Alaska from 2012 to 2016 was 35 sea lions per year, based on (values in parenthesis are the annual mortalities for each fishery) (Muto et al. 2018b):

- From observer data in U.S. commercial fisheries:
    - Bering Sea/ Aleutian Islands flatfish trawl (6.6)
    - Bering Sea/ Aleutian Islands Pacific cod trawl (0.3)
    - Bering Sea/ Aleutian Islands pollock trawl (5.7)
    - Bering Sea/ Aleutian Islands Pacific cod longline (1.3)
    - Gulf of Alaska Pacific cod longline (0.3)
    - Gulf of Alaska Pacific cod trawl (2.2)
    - Gulf of Alaska Pacific sablefish longline (0.8)
    - Gulf of Alaska flatfish trawl (0.2)
    - Gulf of Alaska Pacific rockfish trawl (0.2)
    - Gulf of Alaska pollock trawl (1)
    - Prince William Sound salmon drift gillnet (15)
- From mortality and serious injury reports to the NMFS Alaska Region marine mammal stranding network and Alaska Department of Fish and Game:
    - Entangled in commercial longline gear (0.2)
    - Hooked by southcentral Alaska salmon troll gear (0.2)
    - Hooked by troll gear (0.4)
    - Entangled in unidentified fishing gear (0.4)

Entanglements in marine debris reported to the NMFS Alaska Region stranding network account for a minimum mean annual mortality and serious injury rate of 2 WDPS Steller sea lions from 2012 to 2016 (Muto et al. 2018b). Entanglement in commercial Kodiak salmon hatchery nets had a mean mortality of 0.2 per year for WDPS Steller sea lions from 2012 to 2016 (Muto et al. 2018b)

5.2.5 Pollution

The risk of oil spills or other hazardous materials to Steller sea lions is similar to humpback whales. For more information, please see Section 5.1.5 above.

5.2.6 Natural and Anthropogenic Noise

The impacts of natural and anthropogenic noise to Steller sea lions is similar to humpback whales. For more information, please see Section 5.1.6 above.

Noise Related to Construction Activities
NMFS is conducting another ESA section 7 consultation related to construction activities in Auke Bay for improvements to Statter Harbor. This consultation will likely authorize the take (by harassment) of Steller sea lions from sounds produced during pile driving, drilling, dredging, blasting and vessel operations. The incidental take statements proposes and estimated 134 WDPS Steller sea lions, total, would be taken (by Level B harassment) as a result of exposure to continuous sounds at received levels at or above 120 dB re 1 µPa rms and impulsive sounds at received levels at or above 160 dB re 1 µPa rms. Only one Level A harassment of a WDPS Steller sea lion is likely to be authorized.

Anticipated impacts by harassment from noise associated with construction activities generally include changes in behavioral state from low energy states (i.e., foraging, resting, and milling) to high energy states (i.e., traveling and avoidance).

5.2.7 Subsistence Harvest

The ESA and MMPA allow for the harvest of marine mammals by Alaska Natives for subsistence purposes and for traditional handicrafts. Annual statewide data on community subsistence harvest of Steller sea lions are no longer collected as of 2009. The mean annual subsistence take (harvested plus struck-and-lost) from the Western DPS from 2004 through 2008, combined with the mean take over the 2011-2015 period from St. Paul and St. George, is 204 sea lions per year (Muto et al. 2018a). Subsistence harvest of Western DPS Steller sea lions occurs under co-management agreements with NMFS, and occurs at or well below sustainable levels of harvest.

6. EFFECTS OF THE ACTION

Per 50 CFR 402.02, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action.

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 Biological Assessment (PND Engineers 2019b) the IHA application (PND Engineers 2019a), the proposed notice for issuing the IHA (84 FR 50387), personal communications, and available literature as referenced in this Opinion, our analysis recognizes that the proposed construction activities during the Erickson Residence Marine Access Project may cause these primary stressors:

1. in-water sound fields produced by impulsive noise sources such as impact pile driving;
2. in-water sound fields produced by continuous noise sources such as: vibratory pile removal, vibratory pile driving, down-the-hole drilling, and vessels;
3. in-air sound fields produced by impulsive noise sources such as impact pile driving;
4. risk of vessels striking marine mammals;
5. seafloor disturbance from drilling, pile removal and pile driving activities; and
6. pollution from unauthorized spills

Most of the analysis and discussion of effects to WDPS Steller sea lions and Mexico DPS humpback whales from this action will focus on exposure to in-water impulsive and continuous noise sources because these stressors will likely have the most direct impacts on listed species.

6.1.1 Stressors Expected to Have a Nominal Effect on ESA-listed Species

Based on a review of available information, we determined there are several stressors that will have only minor effects. If an impact will likely be negative, but the consequences are so minute that a person could not measure or detect such responses, then we consider them minor or nominal.

6.1.1.1 In-Air Noise

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 20μPa$_{rms}$ for non-harbor seal pinnipeds

No in-air data are available for vibratory removal of piles, so it is conservatively assumed that vibratory removal of piles will produce the same source level as vibratory installation. Vibratory extraction of 12 to 16-inch timber piles will therefore be estimated to generate the same sound as installation of 18-inch steel piles as described below (87.5 dB rms at 15 meters [49 feet]), which we expect to exceed the Level B behavioral disturbance threshold within 4m of the source (Table 66; see the Table 6 footnote for how distances were calculated).

No unweighted in-air data are available for vibratory installation of 12.75 inch steel piles; however, in-air measurement during vibratory installation of an 18-inch steel pile was 87.5 dB rms at 15 meters (49 feet) (Laughlin 2010).). Vibratory installation of 12.75-inch steel piles will therefore be conservatively estimated to generate 87.5 dB rms at 15 meters (49 feet), which we expect to exceed the Level B behavioral disturbance threshold of 100 dB rms within 4m of the source (Table 66; see the Table 6 footnote for how distances were calculated).

Similarly, no unweighted in-air data are available for vibratory installation of 20-inch steel piles; however, in-air measurements during vibratory installation of 30-inch steel piles averaged 96.5 dB rms at 15 meters (49 feet) (Laughlin 2010). Vibratory installation of 20-inch steel piles will therefore be conservatively estimated to generate 96.5 dB rms at 15 meters (49 feet; Table 66; see the Table 6 footnote for how distances were calculated).

No unweighted in-air data are available for down-hole drilling to secure 20-inch piles into bedrock. Sound will be substantially muted because the drill will be located within and below the pile shaft and drilling/hammering will begin at least 3 to 9 meters (10 to 30 feet) below the marine floor. In-air sound will be conservatively estimated to be the same as from impact hammering (98 dB rms at 15 meters [49 feet]; Table 66).

Unweighted in-air measurements during impact installation of 24-inch steel piles ranged from 97 to 98 dB rms at 15 meters (49 feet) (Magnoni et al. 2014). The source level for impact driving 12.75 and 20-inch steel piles is therefore conservatively estimated to be 98 dB rms at 15 meters (49 feet; Table 66).

Table 6. Distances to the in-air Level B behavioral disturbance threshold for Steller sea lions.

Source	Source Level (dB rms at 15 meters)	In-Air Level B Zones (meters)1	Source
Timber Pile Removal			
Remove 12 to 16 - inch timber piles (6 piles)	87.5	4	Remove 12 to 16 - inch timber piles (6 piles)
Vibratory Pile Driving			
12.75-inch steel pipe installation (4 piles)	87.5	4	12.75-inch steel pipe installation (4 piles)

Source	Source Level (dB rms at 15 meters)	In-Air Level B Zones (meters)1	Source
20-inch steel pipe installation (2 piles)	96.5	10	20-inch steel pipe installation (2 piles)
Impact Pile Driving			
12.75-inch steel pipe installation (4 piles)	98	12	12.75-inch steel pipe installation (4 piles)
20-inch steel pipe installation (2 piles)	98	12	20-inch steel pipe installation (2 piles)
Socketing Pile Installation (Drilling)			
20-inch steel pipe installation (2 piles)	98	12	20-inch steel pipe installation (2 piles)

1Calculated as D = Do * 10[(Source Level – Threshold)/α] where Do is the reference distance for the Source Level (15 meters), Threshold is 100 dB re 20 μPa and α is the transmission loss coefficient, we used α = 20 as this is the standard for hard ground or water.
1Calculated as D = Do * 10[(Source Level – Threshold)/α] where Do is the reference distance for the Source Level (15 meters), Threshold is 100 dB re 20 μPa and α is the transmission loss coefficient, we used α = 20 as this is the standard for hard ground or water.

While WDPS Steller sea lions may be exposed to in-air noise from the pile driving activities, we estimate that this distance will not exceed 39 feet (12 meters). There are no surveyed haulouts within the action area, and any WDPS Steller sea lions exposed to the project sound would only be exposed after swimming into the action area. Any WDPS Steller sea lion close enough to the sound source to be considered a 'take' from in-air noise associated with pile driving would already have been accounted for by in-water take, or avoided due to the proposed mitigation measures.

6.1.1.2 Vessel strike

The possibility of vessel strike associated with the proposed action is extremely unlikely. Tug towing operations for construction occur at relatively low speed limits (5 knots), and the maximum transit speed for tug and barge is anticipated to be 8–10 knots. Once vessels get to the construction site, they will be anchored. Skiffs may transport workers very short distances and at low speeds from shore to the work platform. Due to the common presence of commercial and recreational vessels in the action area and habituation of marine mammals to regular vessel traffic, the use of slow-moving tugboats and barges associated with construction of the project is not anticipated to adversely affect ESA-listed species.

Although risk of vessel strike has not been identified as a significant concern for Steller sea lions (Loughlin and York 2000), the Recovery Plan for this species (NMFS 2008b) 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). Since 2000, there have been four reported ship strikes of Steller sea lions within Alaska, with three occurring in Southeast Alaska.

Although Auke Bay has high volumes of vessel traffic, the likelihood of a vessel strike as a result of the proposed action is low. When vessels are required to transport workers to the work platform, they will be transported by skiff at low speeds across very short distances from the shore. In addition, all project-associated vessels will be required to observe the Alaska humpback whale approach regulations (100 yards), which will further reduce the likelihood of interactions.

In general, the association in space and time of project-related vessels and humpback whales and Steller sea lions is highly unlikely because vessel traffic associated with the proposed action will be minimal. In addition, NMFS's regulations for approaching humpback whales require that vessels not approach within 100 yards. All of these factors limit the risk of strike. We conclude the probability of strike occurring is extremely unlikely.

6.1.1.3 Disturbance to seafloor

During drilling, pile removal, and pile installation, a temporary and localized increase in turbidity and sedimentation near the seafloor is possible in the immediate area surrounding each pile. In general, turbidity associated with pile installation is expected to be localized to about a 25-ft radius around the pile (Everitt et al. 1980).

Considering local currents, tidal action, and implementation of best management practices, any potential water quality exceedances would likely be temporary and highly localized. The local tides and currents would disperse suspended sediments from pile driving operations at a moderate to rapid rate depending on tidal stage.

Therefore, the impact from increased turbidity levels would be negligible to humpback whales and Steller sea lions and would not cause a disruption of behavioral patterns that would rise to the level of harassment.

6.1.1.4 Pollution from Unauthorized Spill

A Spill Prevention, Control, and Countermeasure Plan, Hazardous Material Control Plan, Water Quality Control Plan, and other best management practices will be implemented during construction to prevent contaminants from entering the water column. Plans will be in place and materials will be available for spill prevention and cleanup activities at the construction site will limit potential contamination. Additionally, any small spill is expected to dissipate rapidly. The impact of a small spill is very minor, and he probability of a spill occurring is very small due to the implementation of the above plans.

6.1.2 Stressors Likely to Adversely Affect ESA-listed Species

The following stressors are likely to adversely affect MDPS humpback whales and WDPS Steller sea lions: underwater noise from pile removal, pile driving, and rock drilling. These stressors will be analyzed below in the *Exposure Analysis.*

6.1.2.1 Acoustic Thresholds

As discussed in Section 2, *Description of the Proposed Action*, PND Engineers, Inc. intends to conduct construction activities that would introduce acoustic disturbance (see Table 2).

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). 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) (81 FR 51693). 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[3], expressed in root mean square[4] (rms), from broadband sounds that cause behavioral disturbance, and referred to as Level B harassment under section 3(18)(A)(ii) of the Marine Mammal Protection Act (MMPA):

- impulsive sound: 160 dB re 1 μPa_{rms}
- continuous sound: 120 dB re 1μPa_{rms}

Under the PTS/TTS Technical Guidance, NMFS uses the following thresholds for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (NMFS 2016b). 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 7. PTS Onset Acoustic Thresholds for Level A Harassment (NMFS 2016b).

Hearing Group	**PTS Onset Acoustic Thresholds* (Received Level)**	
	Impulsive	**Non-Impulsive**
Low-Frequency (LF) Cetaceans	$L_{pk,flat}$: 219 dB $L_{E,LF,24h}$: 183 dB	$L_{E,LF,24h}$: 199 dB
Mid-Frequency (MF) Cetaceans	$L_{pk,flat}$: 230 dB $L_{E,LF,24h}$: 185 dB	$L_{E,LF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	$L_{pk,flat}$: 202 dB $L_{E,LF,24h}$: 155 dB	$L_{E,LF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	$L_{pk,flat}$: 218 dB $L_{E,LF,24h}$: 185 dB	$L_{E,LF,24h}$: 201 dB
Otariid Pinnipends (OW) (Underwater)	$L_{pk,flat}$: 232 dB $L_{E,LF,24h}$: 203 dB	$L_{E,LF,24h}$: 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$\mu Pa^2 s$. 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.

[3] 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.
[4] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

The MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment].

While the ESA does not define "harass," NMFS issued guidance interpreting the term "harass" under the ESA 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" (Wieting 2016).

As described below, we anticipate that exposures to listed marine mammals from noise associated with the proposed action may result in disturbance and potential injury. However, no mortalities or permanent impairment to hearing are anticipated.

6.2 Exposure 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, PND proposed mitigation measures as part of the proposed action that should avoid or minimize exposure of MDPS humpback whales and WDPS Steller sea lions to stressors. The monitoring zones shown in Table 1 enable PSOs to be aware of and communicate the presence of marine mammals in the action area outside the shutdown zone and prepare for a potential cease of activity should an animal approach the shutdown zone.

6.2.1 Exposure to noise from pile removal, pile driving, and drilling

MDPS humpback whales and WDPS Steller sea lions may be present within the waters of the action area during the time that the in-water work is being conducted and could be exposed to temporarily elevated underwater noise levels resulting in harassment.

Temporarily elevated underwater noise during pile driving activities (including vibratory pile driving and removal, impact pile driving, and DTH drilling) has the potential to result in Level B (behavioral) harassment of marine mammals. Level A harassment (resulting in injury) is not expected to occur as a result of the proposed activities because shutdown zones will be implemented (Table 3) and the marine mammal monitoring plan in the *Mitigation Measures* will reduce the potential for exposure to levels of underwater noise above the injury threshold established by NMFS.

For this analysis we estimated take by considering: 1) acoustic thresholds above which the best available science indicates listed marine mammals will be behaviorally harassed or incur some degree of hearing impairment; 2) the area that will be ensonified above these levels in a day; 3) the expected density or occurrence of listed marine mammals within these ensonified areas; and

4) and the number of days of activities.

6.2.1.1 Estimated Source Levels from Literature Values

The source levels used for vibratory and impact hammering, and DTH drilling are summarized in Table 8.

Vibratory removal

The source level for vibratory removal of timber piles is from in-water measurements generated by the Greenbusch Group (2018) from the Seattle Pier 62 project (83 FR 39709; August 10, 2018). Hydroacoustic monitoring results from Pier 62 determined unweighted rms ranging from 140 dB to 169 dB. NMFS analyzed source measurements at different distances for all 63 individual timber piles that were removed at Pier 62 and normalized the values to 10 m. The results showed that the median is 152 dB SPLrms (Table 8).

Down-Hole Drilling

The closest known measurements of down-hole drilling similar to this project are from the Kodiak ferry terminal reconstruction project (Denes et al. 2016). The median source level was measured to be 166.2 dB at 10 meters from the source and was found to drop off to <120 dB at 4.25 miles (6.846 kilometers). This sound source verification (SSV) is for 24-inch steel piles, but will be applied to 20-inch piles for the Erickson Residence Marine Access Project (Table 8).

Vibratory Pile Driving

PND (2019b) suggests that the closest known measurements of vibratory pile driving comparable to the 12.75-inch steel piles used in this project are from the installation of 12-inch steel piles as reported in Beuler et al. (2015) with a sound source level of 155 dB RMS at 35 feet (10 meters). There are closer measurements of similar-sized piles, including the Kake Ferry Terminal project where the extraction of 18-inch steel pipe pile using a vibratory hammer resulted in underwater noise levels reaching 156.2 dB RMS at 7 meters (Denes et al. 2016). However, in comparison to these other measurements, a sound source level of 155 dB RMS at 35 feet (10 meters) is reasonable (Table 8).

PND (2019b) suggests that the closest known measurements of vibratory pile driving comparable to the 20-inch steel piles are from the vibratory installation of 36-inch pile as reported in U.S. Navy (2015) with a sound source level of 161 dB RMS at 33 feet (10 meters). Again, there are closer measurements of comparable vibratory pile driving, including 24-inch piles sound source data from Kodiak, Alaska (Denes et al. 2016). According to that study the installation of 24-inch steel pipe piles using a vibratory hammer resulted in underwater noise levels reaching 160.6 dB rms at 9.9 meters (32.5 feet). The source levels are similar enough that we consider 161 dB RMS at 33 feet (10 meters) to be a reasonable level (Table 8).

Impact Pile Driving

PND (2019b) suggests that the closest known measurements of impact pile driving comparable to the 12.75-inch steel piles proposed for this project are from the installation of 12-inch steel piles reported in Bueler et al. (2015), with a sound source level of 177 dB RMS at 35 feet (10 meters; Table 8). We use this source level in our calculations.

PND (2019b) suggests that the closest known measurements of impact pile driving comparable to the 20-inch steel piles proposed for this project are from the installation of 20-inch steel piles reported in Yurk et al. (2016) with a sound source level of 190 dB RMS at 35 feet (10 meters) or 175 dB SEL (Table 8). We use the SEL source level in our calculations.

Table 8. Sound source levels for pile sizes and driving methods

Pile size	**Method**	**Source level**			**Literature source**
		dB RMS	**dB Peak**	**dB SEL**	
12.75-in steel	Vibratory	155	171	155	Caltrans 2015 (proxy from 12-in)
20-in steel	Vibratory	161	--	--	Navy 2015 (proxy from 24-in)
12- to 16-in timber	Vibratory	152	--	--	Greenbusch Group 2018
20-in steel	Drilling	166.2	--	--	Denes *et al.*, 2016 (proxy from 24-in)
12.75-in steel	Impact	177	192	--	Caltrans 2015 (proxy from 12-in)
20-in steel	Impact	190	205	175	Yurk *et al.*, 2016

6.2.1.2 Distances to Level A and Level B Sound Thresholds

Using the best available science, NMFS has developed acoustic thresholds that identify the received level of underwater sound above which exposed marine mammals would be reasonably expected to be behaviorally harassed (equated to Level B harassment) or to incur PTS of some degree (equated to Level A harassment).

Level B Harassment

Though significantly driven by received level, the onset of behavioral disturbance from anthropogenic noise exposure is also informed to varying degrees by other factors related to the source (*e.g.*, frequency, predictability, duty cycle), the environment (*e.g.*, bathymetry), and the receiving animals (hearing, motivation, experience, demography, behavioral context) and can be difficult to predict (Southall et al. 2007b, Ellison et al. 2012). Based on what the available science indicates and the practical need to use a threshold based on a factor that is both predictable and measurable for most activities, NMFS uses a generalized acoustic threshold based on received level to estimate the onset of behavioral harassment. NMFS predicts that marine mammals are likely to be behaviorally harassed in a manner we consider Level B harassment when exposed to underwater anthropogenic noise above received levels of 120 dB re 1 μPa rms for continuous or non-impulsive (*e.g.*, vibratory pile-driving, drilling) and above 160 dB re 1 μPa rms for non-explosive impulsive (*e.g.*, impact pile-driving) or intermittent (*e.g.*, scientific sonar) sources.

PND’s proposed construction activity includes the use of continuous (vibratory pile driving and possibly drilling) and possibly impulsive (impact pile driving) sources, and therefore the 120 and 160 dB re 1 μPa rms thresholds for Level B behavioral harassment are applicable.

The practical spreading model was used by PND to generate the Level B harassment zones for piling and drilling activities. Practical spreading, a form of transmission loss, is described in detail below.

Pile driving and drilling generate underwater noise that can potentially result in disturbance to marine mammals in the project area. Transmission loss (TL) is the decrease in acoustic intensity as an acoustic pressure wave propagates out from a source. TL parameters vary with frequency, temperature, sea conditions, current, source and receiver depth, water depth, water chemistry, and bottom composition and topography. The general formula for underwater TL is:

$TL = B * \log10(R_1/R_2)$, where
R_1 = the distance of the modeled SPL from the driven pile,
R_2 = the distance from the driven pile of the initial measurement, and
B = the TL coefficient that describes the rate of TL or how quickly sound dissipates.

This formula neglects loss due to scattering and absorption, which is assumed to be zero here. The degree to which underwater sound propagates away from a sound source is dependent on a variety of factors, most notably the seafloor bathymetry and presence or absence of reflective or absorptive conditions including in-water structures and sediments. Spherical spreading occurs in a perfectly unobstructed (free-field) environment not limited by depth or water surface, resulting in a 6 dB reduction in sound level for each doubling of distance from the source (B = 20). Cylindrical spreading occurs in an environment in which sound propagation is bounded by the water surface and sea bottom, resulting in a reduction of 3 dB in sound level for each doubling of distance from the source (B = 10). A practical spreading value (B = 15) is often used under conditions where water increases with depth as the receiver moves away from the shoreline, resulting in an expected propagation environment that would lie between spherical and cylindrical spreading loss conditions.

Utilizing the practical spreading loss model, underwater noise will fall below the behavioral effects threshold of 120 dB rms for marine mammals at a maximum radial distance of 2,154 meters for vibratory pile driving of 12.75-inch steel piles, and 5,412 meters for vibratory pile driving of 20-in piles, and 12,022 meters for DTH drilling. Underwater noise will fall below the behavioral effect threshold of 160 dB rms for marine mammals at a maximum radial distance of 135 meters for impact pile driving of 12.75-inch steel piles and 1,000 meters for 20-inch steel piles. Thus, the Level B harassment zones are established (Table 9) for each of these sound sources. Beyond these distances, NMFS anticipates no behavioral disturbance to listed marine mammals (Figure 2).

Table 9. Level B zones calculated using the practical spreading model.

Source	Level B Zones (meters)
Timber Pile Removal	
Remove 12 to 16 -inch timber piles (6 piles)	1,359
Vibratory Pile Driving	

Source	Level B Zones (meters)
12.75-inch steel pipe installation (4 piles)	2,154
20-inch steel pipe installation (20 piles)	5,412
Impact Pile Driving	
12.75-inch steel pipe installation (4 piles)	136
20-inch steel pipe installation (20 piles)	1,000
Socketing Pile Installation (DTH Drilling)	
20-inch steel pipe installation (20 piles)	12,022

Level A Harassment

NMFS's Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS 2016b) identifies dual criteria to assess auditory injury (Level A harassment) to five different marine mammal groups based on hearing sensitivity as a result of exposure to noise from two different types of sources (impulsive or non-impulsive). PND's proposed activity includes the use of non-impulsive (vibratory pile driving and drilling) and possible impulsive (impact pile driving) sources. The Level A thresholds for the onset of PTS are provided in Table 7 and are applicable here.

Calculating the Ensonified Area

This section describes the operational and environmental parameters of the activity that allow NMFS to estimate the area ensonified above the acoustic thresholds.

When the NMFS Technical Guidance (NMFS 2016b) was published, in recognition of the fact that ensonified area/volume could be more technically challenging to predict because of the duration component in the new thresholds, NMFS developed a User Spreadsheet that includes tools to help predict a simple isopleth that can be used in conjunction with marine mammal density or occurrence to help predict takes. Because of some of the assumptions included in the methods used for these tools, it's anticipated that isopleths produced are typically going to be overestimates to some degree, which may result in an overestimate of Level A harassment take. However, these tools offer the best way to predict appropriate isopleths when more sophisticated 3D modeling methods are not available. For stationary sources, the NMFS User Spreadsheet predicts the closest distance at which, if a marine mammal remained at that distance the whole duration of the activity, it would not incur PTS. When using the subset of variables from the NMFS User Spreadsheet shown in Table 10, the calculated isopleths are summarized below in Table 11.

Table 10. NMFS User Spreadsheet Inputs.

Activity and Pile Size →	**Timber Vibratory Removal**	**Vibratory Install 12.75-inch**	**Vibratory Install 20-inch**	**Impact Install 12.75-inch**	**Impact Install Drive 20-inch**	**Vibratory Drilling**
Spreadsheet Tab Used →	**A.1: Vibratory Pile Driving**	**A.1: Vibratory Pile Driving**	**A.1: Vibratory Pile Driving**	**E.1: Impact Pile Driving**	**E.1: Impact Pile Driving**	**A: Stationary: Non-impulsive, Continuous**
Parameters used in spreadsheet						
Source Level	152 dB rms	155 dB rms	161 dB rms	177 dB rms	175 dB SEL	166.2 dB rms
Weighting Factor Adjustment (kHz)	2.5	2.5	2.5	2	2	2.5
Number of strikes per pile	900	1,800	7,200	150	150	18,000
Activity Duration (h) within 24-h period	1.5	2	4	0.008	0.004	10
Propagation (xLogR)	15	15	15	15	15	15
Distance of source level measurement (m)+	10	10	10	10	10	10
# of piles/shots in a 24 h period	6	4	2	4	2	2
Duration to drive (remove) a single pile (min)	15	60	120	N/A	N/A	300
Single Strike Duration (sec)	N/A	N/A	N/A	0.1	0.05	N/A

Table 11. NMFS User Spreadsheet Generated Outputs for Level A Injury Thresholds

User Spreadsheet Output		
Activity	**PTS Isopleth (meters)**	
	MDPS Humpback Whales	**WDPS Steller Sea Lions**
Timber removal	2.2	0.1
Vibratory Install 12.75-inch	6.9	0.3
Vibratory Install 20-inch	17.2	0.7
Impact Install 12.75-inch	60.9	2.4
Impact Install 20-inch	131.1	6.9
Vibratory Drill 20-inch	70.4	3.0

6.2.2 Estimating marine mammal occurrence

Information about the presence, density, or group dynamics of marine mammals informs the take calculations found in Section 10. Reliable densities are not available for the Auke Bay area. Generalized densities for the North Pacific would not be applicable given the high variability in occurrence and density at specific inlets and harbors. Therefore, the applicant used local information on sightings and group size (Ridgeway, pers obs) to arrive at a number of animals expected to occur within the action area per day (PND Engineers 2019a). NMFS agrees with these numbers. For humpback whales, it is assumed that a maximum of four animals per day are likely to occur in the action area. For Steller sea lions, the potential maximum daily occurrence of animals is 121 individuals within the harbor.

Pile removal, installation, and drilling activities are anticipated to occur over a maximum of eight days. Therefore, we anticipate that 32 (8 days X 4 whales per day) humpback whales will experience Level B sound exposure. Of those 32 whales, we anticipate that 6.1 percent will be from the MDPS (Table 5) and the remaining from the delisted HDPS. Therefore, we anticipate that up to two (rounded from 1.95) MDPS humpback whales will experience Level B harassment as a result of elevated sounds from the proposed project. Similarly, we anticipate that 968 (8 days X 121 sea lions per day) Steller sea lions will experience Level B sound exposure. Previously, NMFS has considered 2 percent of Steller sea lions in Southeast Alaska to be from the WDPS based on observations of branded individuals at the Benjamin Island and Little Island haulouts (personal communication, L. Jemison, ADF&G). However, Hastings et al. (2019) suggests that up to 18.1 percent of Steller sea lions in this area could be from the WDPS, therefore we use this value to estimate WDPS Steller sea lion exposures. We anticipate that up to 176 (rounded from 175.2) WDPS Steller sea lions will experience Level B harassment as a result of elevated sounds from the proposed project.

6.3 Response Analysis

As discussed in the *Approach to the Assessment* section of this opinion, 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.

6.3.1 Responses to major noise sources

Loud underwater noise can result in physical effects on the marine environment that can affect marine organisms. Possible responses by MDPS humpback whales and WDPS Steller sea lions to the impulsive and continuous sound produced by pile installation and removal activities are:

- Physical Response
  - Auditory threshold shifts (or hearing loss)
  - Non-auditory physiological effects
- Behavioral responses
  - Auditory interference (masking)
  - Tolerance or Habituation
  - Change in dive, respiration, or feeding behavior
  - Change in vocalizations
  - Avoidance or Displacement
  - Vigilance

As described in the *Exposure Analysis*, MDPS humpback whales and WDPS Steller sea lions are anticipated to occur in the action area and are anticipated to overlap with noise associated with pile installation/pile driving and removal. We assume that some individuals are likely to be exposed and respond to these impulsive and continuous noise sources.

Anthropogenic sounds cover a broad range of frequencies and sound levels and can have a range of highly variable impacts on marine life, from none or minor to potentially severe responses, depending on received levels, duration of exposure, behavioral context, and various other factors. The potential effects of underwater sound from active acoustic sources can potentially result in one or more of the following: temporary or permanent hearing impairment, non-auditory physical or physiological effects, behavioral disturbance, and masking (Richardson et al. 1995, Gordon et al. 2007, Nowacek et al. 2007, Southall et al. 2007b). The degree of effect is intrinsically related to the signal characteristics, received level, distance from the source, and duration of the sound exposure. In general, sudden, high level sounds can cause hearing loss, as can longer exposures to lower level sounds. Temporary or permanent loss of hearing will occur almost exclusively for noise within an animal's hearing range.

Richardson et al. (1995) described zones of increasing intensity of effect that might be expected to occur, in relation to distance from a source and assuming that the signal is within an animal's hearing range. The first zone is the area within which the acoustic signal would be audible (potentially perceived) to the animal, but not strong enough to elicit any overt behavioral or physiological response. The next zone corresponds with the area where the signal is audible to the animal and of sufficient intensity to elicit behavioral or physiological responsiveness. Third is a zone within which, for signals of high intensity, the received level is sufficient to potentially cause discomfort or tissue damage to auditory or other systems. Overlaying these zones to a certain extent is the area within which masking (i.e., when a sound interferes with or masks the ability of an animal to detect a signal of interest that is above the absolute hearing threshold) may occur; the masking zone may be highly variable in size.

The effects of pile installation, pile removal and drilling on marine mammals are dependent on several factors, including the type and depth of the animal; the pile size and type, and the intensity and duration of the pile removal; the substrate; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile removal activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the frequency, received level, and duration of the sound exposure, which are in turn influenced by the distance between the animal and the source. The further away from the source, the less intense the exposure should be. The substrate and depth of the habitat affect the sound propagation properties of the environment.. In addition, substrates that are soft (e.g., sand) would absorb or attenuate the sound more readily than hard substrates (e.g., rock), which may reflect the acoustic wave. Soft porous substrates would also likely require less time to extract the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

6.3.1.1 *Physical Responses*

<u>Auditory Threshold Shifts</u>

Marine mammals exposed to high-intensity sound, or to lower-intensity sound for prolonged periods, can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak et al. 1999). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not fully recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall et al. 2007a). Repeated sound exposure that leads to TTS could cause PTS. In severe cases of PTS, there can be total or partial deafness, while in most cases the animal has an impaired ability to hear sounds in specific frequency ranges(Kryter 1985).

When PTS occurs, there is physical damage to the sound receptors in the ear (i.e., tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall et al., 2007). In addition, other investigators have suggested that TTS is within the normal bounds of physiological variability and tolerance and does not represent physical injury (Ward 1997). Therefore, NMFS does not consider TTS to constitute auditory injury.

Relationships between TTS and PTS thresholds have not been studied in marine mammals—PTS data exists only for a single harbor seal (Kastak et al. 2008)—but are assumed to be similar to those in humans and other terrestrial mammals. PTS typically occurs at exposure levels at least several dB above that which induces mild TTS: a 40-dB threshold shift approximates PTS onset (Kryter et al. 1966), whereas a 6-dB threshold shift approximates TTS onset (e.g., Southall et al., 2007). Based on data from terrestrial mammals, a precautionary assumption is that the PTS thresholds for impulse sounds (such as bombs) are as few as 6 dB higher than the TTS threshold on a peak-pressure basis and PTS cumulative sound exposure level thresholds as few as 15 to 20 dB higher than TTS cumulative sound exposure level thresholds (Southall et al., 2007). Generally, given the higher level of sound or longer exposure duration necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur. This premise holds true for the proposed action.

TTS is the mildest form of hearing impairment that can occur during exposure to sound (Kryter 1985). While experiencing TTS, the hearing threshold rises, and a sound must be at a higher level in order to be heard. In terrestrial and marine mammals, TTS can last from minutes or hours to days (in cases of strong TTS). In many cases, hearing sensitivity recovers rapidly after exposure to the sound. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals.

Marine mammal hearing plays a critical role in communication with conspecifics, and interpretation of environmental cues for purposes such as predator avoidance and prey capture. Depending on the degree (elevation of threshold in dB), duration (i.e., recovery time), and frequency range of TTS, and the context in which it is experienced, TTS can have effects on marine mammals ranging from discountable to serious. For example, a marine mammal may be able to readily compensate for a brief, relatively small amount of TTS in a non-critical frequency range that occurs during a time where ambient noise is lower and there are not as many competing sounds present. Alternatively, a larger amount and longer duration of TTS sustained during a time when communication is critical for successful mother/calf interactions could have more serious impacts.

Humpback whales and Steller sea lions have the potential to experience auditory threshold shifts due to project activities in the action area. As discussed throughout the *Response Analysis* of this Opinion, we expect individuals may experience TTS. The thresholds for the Erickson Residence Marine Access Project are shown in Tables 7, 8, and 9. These instances of exposure assume a uniform distribution of animals and do not account for avoidance. The implementation of mitigation measures to reduce exposure to high levels of noise related to the Erickson Residence Marine Access Project, the short duration of construction activities, and movement of animals reduce the likelihood that exposure to project related noise would cause a behavioral response that may affect vital functions (reproduction or survival), or would result in temporary threshold shift (TTS) or permanent threshold shift (PTS).

<u>Non-auditory Physiological effects</u>

In addition to PTS and TTS, there is a potential for non-auditory physiological effects or injuries that might occur in marine mammals exposed to high level underwater sound or as a secondary effect of extreme behavioral reactions (e.g., change in dive profile as a result of an avoidance reaction) caused by exposure to sound. These impacts can include neurological effects, internal bubble formation, resonance effects, and other types of organ or tissue damage (Cox et al. 2006).

Stress Response

An animal's perception of a threat may be sufficient to trigger stress responses consisting of some combination of behavioral responses, autonomic nervous system responses, neuroendocrine responses, or immune responses (Seyle 1950). In many cases, an animal's first and sometimes most economical (in terms of energetic costs) response is behavioral avoidance of the potential stressor. Autonomic nervous system responses to stress typically involve changes in heart rate, blood pressure, and gastrointestinal activity. These responses have a relatively short duration and may or may not have a significant long-term effect on an animal's fitness.

Neuroendocrine stress responses often involve the hypothalamus-pituitary-adrenal system. Virtually all neuroendocrine functions that are affected by stress—including immune competence, reproduction, metabolism, and behavior—are regulated by pituitary hormones. Stress-induced changes in the secretion of pituitary hormones have been implicated in failed reproduction, altered metabolism, reduced immune competence, and behavioral disturbance (Moberg 1987). Increases in the circulation of glucocorticoids are also equated with stress (Romano et al. 2004).

The primary distinction between stress (which is adaptive and does not normally place an animal at risk) and “distress” is the cost of the response. During a stress response, an animal uses glycogen stores that can be quickly replenished once the stress is alleviated. In such circumstances, the cost of the stress response would not pose serious fitness consequences. However, when an animal does not have sufficient energy reserves to satisfy the energetic costs of a stress response, energy resources must be diverted from other functions. This state of distress will last until the animal replenishes its energetic reserves sufficient to restore normal function.

Relationships between these physiological mechanisms, animal behavior, and the costs of stress responses are well studied through controlled experiments and for both laboratory and free-ranging animals (Holberton et al. 1996). Stress responses due to exposure to anthropogenic sounds or other stressors and their effects on marine mammals have also been reviewed (Romano et al. 2002) and, more rarely, studied in wild populations.

Rolland et al. (2012) found that noise reduction from reduced ship traffic in the Bay of Fundy was associated with decreased stress in North Atlantic right whales. These and other studies lead to a reasonable expectation that some marine mammals will experience physiological stress responses upon exposure to acoustic stressors and that it is possible that some of these would be classified as “distress.” In addition, any animal experiencing TTS would likely also experience stress responses (NRC 2003).

Humpback whales and Steller sea lions have the potential to experience non-auditory physiological effects due to project activities in the Erickson Residence Dock project action area. As discussed throughout the *Response Analysis* of this opinion, we expect individuals may exhibit behavioral responses from project activities. Therefore, we expect ESA-listed whales and pinnipeds may experience stress responses as a result of the proposed project activities because of the exposure to increased levels of anthropogenic sound, primarily from pile removal, installation and drilling activities. If whales and pinnipeds are not displaced and remain in a stressful environment (within the ZOI pile driving activities, e.g.), we expect the stress response will dissipate shortly after the cessation of pile driving. Similarly, if whales or pinnipeds are exposed to sounds from the construction activities, we expect a stress response could accompany a brief startle response. However, in any of the above scenarios, we do not expect significant or long-term harm to individuals from a stress response because the sounds created from pile removal, installation and drilling activities will be brief, allowing the animals to recover from any stress response, and because exclusions zones will be used to eliminate the potential for PTS.

6.3.1.2 *Behavioral Responses*

Behavioral disturbance may include a variety of effects, including subtle changes in behavior (e.g., minor or brief avoidance of an area or changes in vocalizations), and more sustained and/or potentially severe reactions (e.g. displacement from or abandonment of high-quality habitat). Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (e.g., species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors (Southall et al., 2007). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison et al. 2012), and can vary depending on characteristics associated with the sound source (e.g., whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B-C of Southall et al. (2007) for a review of studies involving marine mammal behavioral responses to sound.

Many animals perform vital functions, such as feeding, resting, traveling, and socializing, on a diel (24-hour) cycle. Disruption of such functions resulting from reactions to stressors such as sound exposure are more likely to be significant if they last more than one diel cycle or recur on subsequent days (Southall et al., 2007). Consequently, a behavioral response lasting less than one day and not recurring on subsequent days is not considered particularly severe unless it could directly affect reproduction or survival (Southall et al., 2007). Note that there is a difference between multi-day substantive behavioral reactions and multi-day anthropogenic activities. For example, just because an activity lasts for multiple days does not necessarily mean that individual animals are either exposed to activity-related stressors for multiple days or, further, exposed in a manner resulting in sustained multi-day substantive behavioral responses.

Auditory Masking

Sound can disrupt behavior through masking, or interfering with, an animal's ability to detect, recognize, or discriminate between acoustic signals of interest (e.g., those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson 1995). Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher intensity, and may occur whether the sound is natural (e.g., snapping shrimp, wind, waves, precipitation) or anthropogenic (e.g., shipping, sonar, seismic exploration) in origin. The ability of a noise source to mask biologically important sounds depends on the characteristics of both the noise source and the signal of interest (e.g., signal-to-noise ratio, temporal variability, direction), in relation to each other and to an animal's hearing abilities (e.g., sensitivity, frequency range, critical ratios, frequency discrimination, directional discrimination, age, or TTS hearing loss), and existing ambient noise and propagation conditions.

Under certain circumstances, marine mammals experiencing significant masking could also be impaired from maximizing their performance fitness in survival and reproduction. Therefore, when the coincident (masking) sound is man-made, it may be considered harassment when disrupting or altering critical behaviors. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs during the sound exposure. Because masking (without resulting in TS) is not associated with abnormal physiological function, it is not considered a physiological effect, but rather a potential behavioral effect.

For the pile driving/removal sound generated from the proposed construction activities, sound will consist of low frequency impulsive and continuous noise depending on if they are using an impact or vibratory hammer. Lower frequency anthropogenic sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey noise. This could affect communication signals used by low frequency mysticetes when they occur near the noise band and thus reduce the communication space of animals (Clark et al. 2009) and cause increased stress levels (Foote et al. 2004, Holt et al. 2009). However, marine mammals are thought to be able to compensate for masking by adjusting their acoustic behavior by shifting call frequencies, and/or increasing call volume and vocalization rates. For example, blue whales are found to increase call rates when exposed to seismic survey noise in the St. Lawrence Estuary (Di Lorio and Clark. 2010). In addition, the sound localization abilities of marine mammals suggest that, if signal and noise come from different directions, masking would not be as severe as the usual types of masking studies might suggest (Richardson et al. 1995).

Masking affects both senders and receivers of acoustic signals and can potentially have long-term chronic effects on marine mammals at the population level as well as at the individual level. Low-frequency ambient sound levels have increased by as much as 20 dB (more than three times in terms of SPL) in the world's ocean from pre-industrial periods, with most of the increase from distant commercial shipping (Hildebrand 2009). All anthropogenic sound sources, but especially chronic and lower-frequency signals (e.g., from vessel traffic), contribute to elevated ambient sound levels, thus intensifying masking.

Noise from pile driving/removal and drilling activity is relatively short-term. It is possible that pile driving/removal and drilling noise resulting from this proposed action may mask acoustic signals important to western DPS Steller sea lions and Mexico DPS humpback whales, but the short-term duration, limited affected area, and pauses between operations would limit the impacts from masking. Any masking event that could possibly rise to Level B harassment under the MMPA would occur concurrently within the zones of behavioral harassment already estimated for in Tables 7, 8, and 9, and which have already been taken into account in the exposure analysis.

Habituation

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok et al. 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a “progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial,” rather than as, more generally, moderation in response to human disturbance (Bejder et al. 2009). The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. As noted, behavioral state may affect the type of response. For example, animals that are resting may show greater behavioral change in response to disturbing sound levels than animals that are highly motivated to remain in an area for feeding (Richardson et al., 1995; NRC 2003; Wartzok et al., 2003).

Controlled experiments with captive marine mammals have showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway et al. 1997). Observed responses of wild marine mammals to loud, intermittent sound sources (typically seismic airguns or acoustic harassment devices) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Richardson et al., 1995).

Given the short duration of the proposed activity (no more than 8 days and no more than 2 hours per day of pile removal, installation or drilling activities) we do not anticipate that animals will habituate to the acoustic disturbances associated with the proposed project. We consider avoidance or displacement as the more likely behavioral response (see discussion below).

<u>Change in dive, respiration, or feeding behavior</u>

Available studies show wide variation in response to underwater sound; therefore, it is difficult to predict specifically how any given sound in a particular instance might affect marine mammals perceiving the signal. If a marine mammal does react briefly to an underwater sound by changing its behavior or moving a small distance, the impacts of the change are unlikely to be significant to the individual, let alone the stock or population. However, if a sound source displaces marine mammals from an important feeding or breeding area for a prolonged period, impacts on individuals and populations could be significant (Lusseau and Bejder 2007). This highlights the importance of assessing the context of the acoustic effects alongside the received levels anticipated. Severity of effects from a response to an acoustic stimuli can likely vary based on the context in which the stimuli was received, particularly if it occurred during a biologically sensitive temporal or spatial point in the life history of the animal. There are broad categories of potential response, which we describe in greater detail here, that include alteration of dive behavior, alteration of foraging behavior, effects to breathing, interference with or alteration of vocalization, avoidance, and flight.

Changes in dive behavior can vary widely, and may consist of increased or decreased dive times and surface intervals, as well as changes in the rates of ascent and descent during a dive (Frankel and Clark 2000). Variations in dive behavior may reflect interruptions in biologically significant activities (e.g., foraging) or they may be of little biological significance. The impact of an alteration to dive behavior resulting from an acoustic exposure depends on what the animal is doing at the time of the exposure and the type and magnitude of the response.

Disruption of feeding behavior can be difficult to correlate with anthropogenic sound exposure, so it is usually inferred by observed displacement from known foraging areas, the appearance of secondary indicators (e.g., bubble nets or sediment plumes), or changes in dive behavior. As for other types of behavioral response, the frequency, duration, and temporal pattern of signal presentation, as well as differences in species sensitivity, are likely contributing factors to differences in response in any given circumstance (Croll et al. 2001). A determination of whether foraging disruptions incur fitness consequences would require information on or estimates of the energetic requirements of the affected individuals and the relationship between prey availability, foraging effort and success, and the life history stage of the animal.

Rates of respiration naturally vary with different behaviors, and alterations to breathing rate as a function of acoustic exposure can be expected to co-occur with other behavioral reactions, such as a flight response or an alteration in diving. However, respiration rates in and of themselves may be representative of annoyance or an acute stress response. Various studies have shown that respiration rates may either be unaffected or could increase, depending on the species and signal characteristics, again highlighting the importance in understanding species differences in the tolerance of underwater noise when determining the potential for impacts resulting from anthropogenic sound exposure (Kastelein et al. 2001).

As a result of using this kind of analyses to consider humpback whales' and Steller sea lions' behavioral decisions, we would expect these animals to continue foraging in the face of moderate levels of disturbance. For example, humpback whales, which only feed during part of the year and must satisfy their annual energetic needs during the foraging season, may continue foraging in the face of disturbance in the action area. Similarly, a humpback cow accompanied by her calf is less likely to flee or abandon an area at the cost of her calf's survival. By extension, we assume that animals that choose to continue their pre-disturbance behavior would have to cope with the costs of doing so, which will usually involve physiological stress responses and the associated energetic costs (Frid and Dill. 2002, MMS 2008). Therefore, it is likely some change in dive, respiration, or feeding behavior of WDPS Steller sea lions and MDPS humpback whales may occur in the action area as a result of the presence of the vessel, general construction activities, and sound generated by the pile removal, installation and drilling activities; however, as the duration of the activities are brief and localized to a small area of Auke Bay, we anticipate that any changes in these behaviors will be insignificant.

<u>Change in vocalizations</u>

Marine mammals vocalize for different purposes and across multiple modes, such as whistling, echolocation click production, calling, and singing. Changes in vocalization behavior in response to anthropogenic noise can occur for any of these modes and may result from a need to compete with an increase in background noise or may reflect increased vigilance or a startle response. In some cases, animals may cease sound production during production of aversive signals (Bowles et al. 1994).

In addition to these behavioral responses, whales alter their vocal communications when exposed to anthropogenic sounds. Communication is an important component of the daily activity of animals and ultimately contributes to their survival and reproductive success. Animals communicate to find food (Marler et al. 1986, Elowson et al. 1991), acquire mates (Ryan 1985), assess other members of their species (Parker 1974, Owings et al. 2002), evade predators (Greig-smith 1980), and defend resources (Zuberbuhler et al. 1997). Human activities that impair an animal's ability to communicate effectively might have significant effects on the survival and reproductive performance of animals experiencing the impairment.

At the same time, most animals that vocalize have evolved with an ability to make adjustments to their vocalizations to increase the signal-to-noise ratio, active space, and recognizability of their vocalizations in the face of temporary changes in background noise (Cody and Brown 1969, Brumm 2004, Patricelli and Blickley 2006). A few studies have demonstrated that marine mammals make the same kind of vocal adjustments in the face of high levels of background noise. For example, two studies reported that some mysticete whales stopped vocalizing – that is, adjusted the temporal delivery of their vocalizations – when exposed to active sonar (Miller et al.

2000, Melcon et al. 2012). Melcón et al. (2012) reported that during 110 of the 395 d-calls (associated with foraging behavior) they recorded during mid-frequency active sonar transmissions, blue whales stopped vocalizing at received levels ranging from 85 to 145 dB, presumably in response to the sonar transmissions. These d-calls are believed to attract other individuals to feeding grounds or maintain cohesion within foraging groups (Oleson et al. 2007).

Humpback whales have been observed to increase the length of their songs in the presence of potentially masking signals (Miller et al. 2000, Fristrup et al. 2003). Change in humpback vocalization may happen within the project area, but to a minimal extent due to the mitigation measures put in place to reduce in-water noise.

Avoidance or displacement

Avoidance is the displacement of an individual from an area or migration path because of the presence of a sound or other stressors, and is one of the most obvious manifestations of disturbance in marine mammals (Richardson et al., 1995). For example, gray whales (*Eschrictius robustus*) are known to change direction—deflecting from customary migratory paths—in order to avoid noise from seismic surveys (Malme et al. 1984). Avoidance may be short-term, with animals returning to the area once the noise has ceased (e.g., Bowles et al., 1994). Longer-term displacement is possible, however, which may lead to changes in abundance or distribution patterns of the affected species in the affected region if habituation to the presence of the sound does not occur (Blackwell et al. 2004).

A flight response is a dramatic change in normal movement to a directed and rapid movement away from the perceived location of a sound source. The flight response differs from other avoidance responses in the intensity of the response (e.g., directed movement, rate of travel). Relatively little information on flight responses of marine mammals to anthropogenic signals exist, although observations of flight responses to the presence of predators have occurred (Connor and Heithaus 1996). The result of a flight response could range from brief, temporary exertion and displacement from the area where the signal provokes flight to, in extreme cases, marine mammal strandings (Evans and England 2001). However, it should be noted that response to a perceived predator does not necessarily invoke flight (Ford and Reeves 2008), and whether individuals are solitary or in groups may influence the response.

Avoidance is one of many behavioral responses whales and Steller sea lions exhibit when exposed to pile driving and drilling noise. Other behavioral responses include evasive behavior to escape exposure or continued exposure to a sound that is painful, noxious, or that they perceive as threatening, which we would assume would be accompanied by acute stress physiology; increased vigilance of an acoustic stimulus, which would alter their time budget (that is, during the time they are vigilant, they are not engaged in other behavior); and continued pre-disturbance behavior with the physiological consequences of continued exposure. This avoidance behavior is expected to occur with the Steller sea lions and humpback whales in the action area.

Vigilance

Behavioral disturbance can also impact marine mammals in more subtle ways. Increased vigilance may result in costs related to diversion of focus and attention (i.e., when a response consists of increased vigilance, it may come at the cost of decreased attention to other critical behaviors such as foraging or resting). These effects have generally not been demonstrated for marine mammals, but studies involving fish and terrestrial animals have shown that increased vigilance may substantially reduce feeding rates (Beauchamp and Livoreil 1997). In addition, chronic disturbance can cause population declines through reduction of fitness (e.g., decline in body condition) and subsequent reduction in reproductive success, survival, or both (Harrington and Veitch 1992). However, Ridgway et al. (2006) reported that increased vigilance in bottlenose dolphins exposed to sound over a five-day period did not cause any sleep deprivation or stress effects.

Humpback whales and Steller sea lions have the potential to exhibit each of these behavioral responses (auditory interference (masking); tolerance or habituation; change in dive, respiration, or feeding behavior; change in vocalizations; avoidance or displacement; increased vigilance) due to project activities in the action area.

6.3.2 Anticipated Effects on Habitat

The proposed activities at the project area would not result in permanent negative impacts to habitats used directly by marine mammals, but may have potential short-term impacts to food sources, such as forage fish, and may affect acoustic habitat. There are no known foraging hotspots or other ocean bottom structure of significant biological importance to Steller sea lions present in the marine waters of the action area during the construction window. While humpbacks are known to feed in Auke Bay occasionally, the small portion of the area affected by the construction noise, in conjunction with the short temporal scale of construction activity, make it unlikely the effects of the construction will significantly alter the foraging habitat of humpbacks in the vicinity. Therefore, the main impact issue associated with the proposed action would be temporarily elevated sound levels and the associated direct effects on marine mammals, as discussed previously in this document. The primary potential acoustic impacts to marine mammal habitat are associated with elevated sound levels produced by pile installation and pile removal.

Short-term turbidity increases would likely occur during in-water construction work, including pile driving and pile removal. The physical resuspension of sediments could produce localized turbidity plumes that could last from a few minutes to several hours. In general, turbidity associated with pile installation is expected to be localized to about a 25 ft radius around the pile (Everitt et al. 1980). Contaminated sediments are not expected at the project site but any that do occur would be tightly bound to the sediment matrix. Because of the relatively small work area, any increase in turbidity would be limited to the immediate vicinity of the project site and adjacent portion of the bay. There is little potential for pinnipeds or cetaceans to be exposed to increased turbidity during construction operations. Therefore, exposure to re-suspended contaminants is expected to be negligible since sediments would not be ingested and any contaminants would be tightly bound to them.

Considering local currents, tidal action, and implementation of BMPs, any potential water quality exceedances would likely be temporary and highly localized. The local tides and currents would disperse suspended sediments from pile driving operations at a moderate to rapid rate depending on tidal stage.

6.3.3 In-water Construction Effects on Potential Prey (Fish)

Construction activities would produce continuous (i.e., vibratory pile driving and removal, and drilling) and impulsive (impact pile driving) sounds. Fish react to sounds that are especially strong and/or intermittent low-frequency sounds. Short duration, sharp sounds can cause overt or subtle changes in fish behavior and local distribution. Hastings and Popper (2005) identified several studies that suggest fish may relocate to avoid certain areas of sound energy. Additional studies have documented effects of impulsive sounds such as pile driving on fish, although several are based on studies in support of large, multiyear bridge construction projects (Scholik and Yan 2001, Scholik and Yan 2002, Popper and Hastings 2009). Sound pulses at received levels of 160 dB may cause subtle changes in fish behavior. SPLs of 180 dB may cause noticeable changes in behavior (Pearson et al. 1992, Skalski et al. 1992). SPLs of sufficient strength have been known to cause injury to fish and fish mortality.

The most likely impact to fish from pile installation/removal activities in the action area would be temporary behavioral avoidance of the area. The duration of fish avoidance of this area after pile driving stops is unknown, but a rapid return to normal recruitment, distribution, and behavior is anticipated. In general, impacts to marine mammal prey species are expected to be minor and temporary due to the short timeframe for the project.

6.3.4 Effects on Potential Fish Foraging Habitat

The area likely impacted by the project is relatively small compared to the available habitat in Auke Bay. Avoidance by potential prey of the immediate area due to the temporary loss of this foraging habitat is also possible. The duration of fish avoidance of this area after construction activity stops is unknown, but a rapid return to normal recruitment, distribution and behavior is anticipated. Any behavioral avoidance by fish of the disturbed area would still leave significantly large areas of fish and marine mammal foraging habitat in the nearby vicinity in Auke Bay.

Given the short daily duration of sound associated with individual construction activities and the relatively small areas being affected, the proposed action is not likely to have an adverse effect on fish habitat or fish populations to any measurable degree. Thus, any impacts to marine mammal habitat are not expected to cause significant or long-term consequences for individual marine mammals or their populations.

6.3.5 Responses to vessel traffic and noise

MDPS humpback whales and WDPS Steller sea lions are anticipated to occur in the action area and are anticipated to overlap with noise associated with vessel transit. We assume that some individuals are likely to be exposed and respond to this continuous noise source.

Materials and equipment would be transported to the project site by barge. While work is conducted in the water, anchored barges will be used to stage construction materials and equipment. Vessel speed, course changes, and sounds associated with their engines may be considered stressors to listed humpback whales.

We anticipate low level exposure of short-term duration to listed marine mammals from vessel noise. If animals do respond, they may exhibit slight deflection from the noise source, engage in low-level avoidance behavior, short-term vigilance behavior, or short-term masking behavior, but these behaviors are not likely to result in adverse consequences for the animals. The nature and duration of response is not anticipated to be a significant disruption of important behavioral patterns such as feeding or resting. During the period of construction, the action area is not considered high quality habitat for humpback whales or Steller sea lions, so avoidance of the area is not likely to adversely affect these species**.**

The small number of vessels involved in the action, the short duration of exposure due to the transitory nature, and vessels following the Alaska Humpback Whale Approach Regulations and marine mammal code of conduct should prevent close approaches and additional harassment of Steller sea lions and humpback whales. The impact of vessel traffic on MDPS humpback whales and WDPS Steller sea lions is not anticipated to reach the level of harassment under the ESA. Furthermore, the proposed dock being analyzed in this opinion is a replacement of an existing dock servicing a private residence. Therefore, once the project is complete, we do not anticipate increased vessel traffic in the area as a result of this action.

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.

Climate change, as well as some continuing and future non-Federal activities expected to contribute to climate change, are reasonably certain to occur 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).

There are currently no other known or anticipated state or private activities reasonably certain to occur in the action area that may affect listed species and are not subject to section 7 consultation. We searched for information on non-Federal actions reasonably certain to occur in the action area. We did not find any information about non-Federal actions other than what has already been described in the Environmental Baseline (Section 5 of this opinion). As the dock proposed for construction is a replacement of an existing dock, the proposed project is not anticipated to result in an increase in marine traffic in the action area, nor is it anticipated to result in increased fishing efforts in the area as the dock serves a private residence. We expect fisheries, harvest, noise, pollutants and discharges, scientific research, and ship strikes will continue into the future. We expect moratoria on commercial whaling and bans on commercial sealing will remain in place, aiding in the recovery of ESA-listed whales and pinnipeds.

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 potential reductions in 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.

8.1 MDPS Humpback Whale Risk Analysis

Our consideration of probable exposures and responses of listed whales to construction 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 MDPS humpback whales.

Exposure to in-air noise, vessel noise from transit, disturbance to the seafloor, and potential for vessel strike may occur, but these are likely to be negligible due to the small marginal increase in such activities relative to the environmental baseline, mitigation measures in place to reduce approach distances, and the transitory nature of vessels and construction activities. Adverse effects from vessel strike are very unlikely because of the few additional vessels introduced by the action and the unlikelihood of these type of interactions.

Humpback whales' probable response to the proposed action includes brief startle reactions or short-term behavioral modification. These reactions and behavioral changes are expected to subside quickly when the exposures cease. The primary mechanism by which the behavioral changes we have discussed affect the fitness of individual animals is through the animals' energy budget, time budget, or both (the two are related because foraging requires time). Large whales such as 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 discussed are not likely to reduce the energy budgets of humpback whales, and their probable exposure to noise sources is not likely to reduce their fitness.

As discussed in the *Description of the Action* and *Status of the Species* sections, this action does not overlap in space or time with humpback whale breeding. Some MDPS humpback whales feed in Southeast Alaska in the summer months, but they migrate to Mexican waters for breeding and calving in winter months. As a result, the probable responses to the proposed action are not likely to reduce the current or expected future reproductive success of Mexico DPS humpback whales or reduce the rates at which they grow, mature, or become reproductively active. Noise from the proposed action could discourage MDPS whales from feeding in the action area during some construction activities, but humpback whale feeding in the action area is not common, and any such effects would be brief and the affected whales would likely find other comparable foraging opportunities in the vicinity.

Therefore, these exposures are not likely to reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent. The short duration of sound generation and implementation of mitigation measures to reduce exposure to high levels of sound reduce the likelihood that exposure would cause a behavioral response that may affect vital functions, or cause TTS or PTS. Cumulative effects of future state or private activities in the action area are likely to affect humpback whales at a level comparable to present.

The strongest evidence supporting the conclusion that the proposed action will likely have minimal impact on MDPS humpback whales is the estimated annual growth rate of the humpback whale populations in the North Pacific (5-7%). While there is no accurate estimate of the maximum productivity rate for humpback whales, it is assumed to be 7% (Wade and Angliss 1997, Allen and Angliss 2015). Despite exposure to pile driving operations for decades, a small number of humpback whale entanglements in fishing gear, a subsistence take of one humpback whale in 2006, and a humpback whale taken illegally near Toksook Bay in western Alaska for subsistence in 2016, this increase in the number of listed whales suggests that the stress regime these whales are exposed to has not prevented them from increasing their numbers.

As a result of all the above factors, this project is not likely to appreciably reduce MDPS humpback whales' likelihood of surviving or recovering in the wild.

8.2 WDPS Steller Sea Lion Risk Analysis

The Steller sea lion recovery plan (NMFS 2008) lists recovery criteria that should be accomplished in order to downlist the WDPS from endangered to threatened and to delist the WDPS. More details and exact specifications can be found in the plan, but these criteria generally include an increased population size, requirements that any two adjacent sub-regions cannot be declining significantly, reducing the threats to sea lion foraging habitat, reducing intentional killing and overutilization, and others. NMFS concludes that WDPS Steller sea lion response from the proposed activities will not impede progress towards these recovery criteria due to the low proportion of Steller sea lions in the area that belong to the WDPS, low anticipated level of harassment, no anticipated injury or mortality, and no significant effects to habitat.

Exposure to in-air noise, vessel noise from transit, disturbance to the seafloor and vessel strike may occur, but these are likely to be negligible due to the small marginal increase in such activities relative to the environmental baseline, mitigation measures in place to reduce approach distances, and the transitory nature of vessels and construction activities. Adverse effects from vessel strike are very unlikely because of the few additional vessels introduced by the action and the unlikelihood of these type of interactions.

Steller sea lions’ probable response to this project (pile driving and removal, and drilling) after implementation of the mitigations measures in Section 2.1.2 includes brief startle reactions or short-term behavioral modification, such as those listed in Section 6.3.1.2. These reactions and behavioral changes are expected to subside quickly when the exposures cease. The primary mechanism by which these behavioral changes could affect the fitness of individual animals is through the animals’ energy budget, time budget, or both (see Section 6.3.1.2). Even if some WDPS Steller sea lions were exposed to the stressors from construction activities associated with this project, the individual and cumulative energy costs of the behavioral responses are not likely to reduce the energy budgets of Steller sea lions, and their probable exposure to noise sources is not likely to reduce their fitness because project related noise is relatively short-term, in a limited affected area, and pauses between operations would limit the impacts.

Most adult Steller sea lions occupy rookeries during the pupping and breeding season, which extends from late May to early July (NMFS 2008). The endangered WDPS Steller sea lion population is increasing at 2.17 percent per year. NMFS does not anticipate any effects from this action on the reproductive success of Steller sea lions. As discussed in the *Description of the Action* section, this action area does not overlap with sea lion rookeries. As a result, the probable responses to this project are not likely to reduce the current or expected future reproductive success of WDPS Steller sea lions or reduce the rates at which they grow, mature, or become reproductively active.

Commercial fishing likely affects prey availability throughout much of the WDPS’s range and causes a small number of direct mortalities each year. Predation has been considered a potentially high-level threat to this DPS and is likely to remain a threat. Subsistence hunting occurs at fairly low levels for this DPS. Illegal harvest is also a continuing threat, but it probably does not occur at levels that are preventing recovery. Ship strikes do not seem to be of concern for this species due to its maneuverability and agility in water. Despite exposure to construction activities and ferry and vessel operations for decades, the increase in the number of WDPS Steller sea lions suggests that the stress regime these sea lions are exposed to has not prevented them from increasing their numbers and expanding their use of the action area.

Therefore, exposures associated with the proposed action are not likely to reduce the abundance, reproduction rates, or growth rates (or increase variance in one or more of these rates) of the populations those individuals represent. While a single individual may be exposed multiple times during the project, both the short duration of sound generation and the implementation of mitigation measures to reduce exposure to high levels of sound reduce the likelihood that exposure would cause a behavioral response that may affect vital functions, or cause TTS or PTS. Cumulative effects of future state or private activities in the action area are likely to affect Steller sea lions at a level comparable to present. The current and recent population trends for WDPS Steller sea lions indicate that these levels of activity are not hindering population growth.

As a result of all of the above factors, this project is not likely to appreciably reduce WDPS Steller sea lions’ likelihood of surviving or recovering in the wild.

9. CONCLUSION

After reviewing the current status of the listed 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 WDPS Steller sea lions (*Eumetopias jubatus*) or MDPS humpback whales (*Megaptera novaeangliae*).

10. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA prohibits the take of endangered species unless there is a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity (50 CFR 402.02). Based on NMFS guidance, the term "harass" under the ESA means 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" (Wieting 2016). The MMPA defines "harassment" as: any act of pursuit, torment, or annoyance which (i) has the potential to injure a marine mammal or marine mammal stock in the wild [Level A harassment]; or (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [Level B harassment] (16 U.S.C. §1362(18)(A)(i) and (ii)). For this consultation, USACE and PR1 anticipate that any take will be by harassment only.

Under the terms of Section 7(b)(4) and Section 7(o)(2) of the ESA, taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA, provided that such taking is in compliance with the terms and conditions of an Incidental Take Statement (ITS).

Section 7(b)(4)(C) of the ESA provides that if an endangered or threatened marine mammal is involved, the taking must first be authorized by Section 101(a)(5) of the MMPA. Accordingly, **the terms of this incidental take statement and the exemption from Section 9 of the ESA become effective only upon the issuance of MMPA authorization to take the marine mammals identified here (Section 9 of the ESA, however, does not apply to ringed or bearded seals)**. Absent such authorization, this incidental take statement is inoperative. This ITS is valid only for the activities described in this Opinion, and which have been authorized under section 101(a)(5) of the MMPA.

The terms and conditions described below are nondiscretionary. USACE and PR1 have a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, USACE must monitor the progress of the action and its impact on the species as specified in the ITS (50 CFR 402.14(i)(3)). If USACE and PR1 (1) fail to require the authorization holder to adhere to the terms and conditions of the ITS through enforceable terms that are added to the authorization, and/or (2) fail to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

10.1 Amount or Extent of Take

Section 7 regulations require NMFS to estimate the number of individuals that may be taken by proposed actions or utilize a surrogate (e.g., other species, habitat, or ecological conditions) if we cannot assign numerical limits for animals that could be incidentally taken during the course of an action (50 CFR § 402.14 (i)(1); see also 80 FR 26832 (May 11, 2015). The taking of 2 Mexico DPS humpback whales and 968 Western DPS Steller sea lions will be by incidental harassment only, caused by sound from pile driving with received levels in excess of NOAA Fisheries acoustic guidelines for MMPA Level B take. The taking by serious injury or death is not authorized and may result in the modification, suspension, or revocation of the ITS.

10.1.1 WDPS Steller Sea Lions

Based on the distances to Level A and Level B sound thresholds calculated in Section 6.2.1.2, and the estimate of marine mammal occurrence calculated in Section 6.2.2 of the *Exposure Analysis* for the proposed activities, we expect a maximum of 968 (8 days of activity X 121 sea lions per day) Steller sea lions may be behaviorally harassed by noise from pile installation/removal activities, and we assume that 18.1% (176) of those individuals are from the WDPS (Table 12). We expect 176 Level B takes (see Table 9). We are reasonably certain this take will occur.

10.1.2 MDPS Humpback Whales

Based on the distances to Level A and Level B sound thresholds calculated in Section 6.2.1.2, and the estimate of marine mammal occurrence calculated in Section 6.2.2 of the *Exposure Analysis* for the proposed activities, we expect a maximum of 32 (8 days of activity X 4 whales per day) humpback whales may be behaviorally harassed by noise from pile installation/removal activities, and we assume that 6.1percent (2) of those individuals are from the MDPS (Table 12). We expect both to be Level B take (see Table 9). We are reasonably certain this take will occur.

Table 12. Summary of instances of acoustic exposure associated with the proposed action's activities reasonably certain to result in the incidental take of humpback whales and Steller sea lions by behavioral harassment

Source	**Estimated Duration**		**Mexico DPS Humpback Whales**	**Western DPS Steller Sea Lions**
	Hours per Day	**Ant. Days of Effort**		
Pile Removal	1	2	0	44
Pile Driving and Drilling	2	6	2	132
		Total Takes	2	176

10.2 Effect of the Take

The only takes authorized during the proposed action are takes by acoustic harassment. No serious injuries or mortalities are anticipated or authorized as part of this proposed action. This consultation has assumed that exposure to major noise sources might disrupt one or more behavioral patterns that are essential to an individual animal's life history. However, any behavioral responses of these whales and pinnipeds to major noise sources and any associated disruptions are not expected to affect the reproduction, survival, or recovery of these species.

In Section 9 of this Opinion, NMFS determined that the level of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to Mexico DPS humpback whales or Western DPS Steller sea lions.

10.3 Reasonable and Prudent Measures (RPMs)

"Reasonable and prudent measures" are those actions necessary or appropriate to minimize the impacts, i.e., amount or extent, of incidental take. (50 CFR 402.02). These are nondiscretionary measures.

The RPMs included below, along with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. NMFS concludes that the following RPMs are necessary and appropriate to minimize or to monitor the incidental take of Mexico DPS humpback whales and Western DPS Steller sea lions resulting from the proposed action.

1. USACE and PR1 will implement a monitoring program that includes all items described in the mitigation measures section of this Opinion (Section 2.1.2) and allows NMFS AKR to evaluate the exposure estimates contained in this Opinion and that underlie this ITS.
2. USACE and PR1 will submit a final report to NMFS AKR that evaluates the mitigation measures and the results of the monitoring program.

11.4 Terms and Conditions

"Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These must be carried out for the exemption in section 7(o)(2) to apply.

In order to be exempt from the prohibitions of section 9 of the ESA, the USACE and PR1 or any applicant must comply with the following terms and conditions, which implement the RPMs described above and the mitigation measures set forth in Section 2.1.2 of this opinion. The USACE and PR1 or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this incidental take statement (50 CFR 402.14).

Partial compliance with these terms and conditions may result in more take than anticipated, and may invalidate this take exemption. These terms and conditions constitute no more than a minor change to the proposed action because they are consistent with the basic design of the proposed action.

To carry out RPM #1, USACE, NMFS PR1, or their authorization holder must undertake the following:

A. The exclusion (shutdown) and disturbance zones (see section 2.1.2.2) must be fully observed by qualified PSOs during all in-water work, in order to document observed incidents of harassment as described in the mitigation measures associated with this action.

B. If take of Steller sea lions approaches 968 (equivalent to 176 WDPS Steller sea lions) or if the take of humpback whales approaches 32 (equivalent to 2 MDPS humpback whales), USACE and PR1 will notify NMFS by email, attn: greg.balogh@noaa.gov and request reinitiation of consultation.

To carry out RPM #2, USACE, NMFS PR1, or their authorization holder must:

A. Adhere to all monitoring and reporting requirements as detailed in the IHA issued by NMFS under section 101(a)(5) of the MMPA.

B. Immediately report the taking of any marine mammal in a manner other than that described in this ITS. Reports must be made to NMFS AKR, Protected Resources Division at 907-586-7638 and to Greg.balogh@noaa.gov.

   In the event that the proposed action causes a take of a marine mammal that results in a serious injury or mortality (e.g. ship-strike, stranding, and/or entanglement), immediately cease operations and immediately report the incident to NMFS AKR, Protected Resources Division at 907-586-7638 and/or by email to Jon.Kurland@noaa.gov, greg.balogh @noaa.gov, the NMFS Alaska Regional Stranding Coordinator at 907-271-3448 or Barbara.Mahoney@noaa.gov, and NMFS Permits and Conservation Division at 301-427-8401 or Sara.Young@noaa.gov.

   Following a prohibited take, USACE and PR1 must reinitiate consultation under 50 CFR 402.16, and any subsequent activities causing incidental take will not be exempt from the take prohibitions of ESA section 9 unless and until authorized via a new ITS. NMFS will work with USACE and PR1 to determine what is necessary to minimize the likelihood of further prohibited take and ensure ESA compliance.

C. Submit a project specific report within 90 days of the conclusion of the project that analyzes and summarizes marine mammal interactions during this project to the Protected Resources Division, NMFS by email to greg.balogh @noaa.gov. This report must contain the following information:

   - Date and time that monitored activity begins or ends;
   - Construction activities occurring during each observation period;
   - Weather parameters (e.g., percent cover, visibility);
   - Water conditions (e.g., sea state, tide state);
   - Species, numbers, and, if possible, sex and age class of marine mammals;
   - Description of any observable marine mammal behavior patterns, including bearing

and direction of travel and distance from construction activity;
- Distance from construction activities to marine mammals and distance from the marine mammals to the observation point;
- Locations of all marine mammal observations; and
- Other human activity in the area.

12. 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).

For this project, NMFS AKR recommends:

1. Project vessel crews should participate in the WhaleAlert program to report real-time sightings of whales while transiting in the waters of Southeast Alaska and to minimize the risk of vessel strikes. More information is available at https://alaskafisheries.noaa.gov/pr/whale-alert.

In order to keep NMFS's Protected Resources Division informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, USACE and NMFS PR1 should notify NMFS of any conservation recommendations they implement in their final action.

13. 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.

14. 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.

14.1 Utility

This document records the results of an interagency consultation. The information presented in this document is useful NMFS, USACE, 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.

14.2 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.

14.3 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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