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 for Construction at the City Dock and Ferry Terminal in Tenakee Springs, Alaska and Issuance of Incidental Harassment Authorization under 101(a)(5)(D) of the Marine Mammal Protection Act

NMFS Consultation Number: AKR-2018-9756

Action Agencies: **National Marine Fisheries Service, Office of Protected Resources, Permits and Conservation Division (PR1), and Federal Highway Administration (FHWA)**

Affected Species and Determinations:

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

Consultation Conducted By: National Marine Fisheries Service, Alaska Region

Issued By:

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

Date: June 18, 2018

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TERMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
ADOT&PF	Alaska Department of Transportation and Public Facilities
AMHS	Alaska Marine Highway System
BA	Biological Assessment
BMPs	Best Management Practices
dB	decibels
dBA	A-weighted decibels
CFR	Code of Federal Regulations
CWA	Clean Water Act
DPS	Distinct Population Segment
DTH	Down-the-hole
ESA	Endangered Species Act
FR	Federal Register
GOA	Gulf of Alaska
GPIP	Gary Paxton Industrial Park
HMCP	Hazardous Material Control Plan
IHA	Incidental Harassment Authorization
ITS	Incidental Take Statement
kHz	kilohertz
MLLW	Mean Lower Low Water
MMPA	Marine Mammal Protection Act
μPa	microPascals
NMFS	National Marine Fisheries Service
NRC	National Research Council
PBF	physical or biological features
PR1	Protected Resources, NMFS Headquarters Office
PRD	Protected Resources Division, Alaska NMFS
PSO	Protected Species Observers
PTS	Permanent Threshold Shifts
rms	root mean square
RPM	Reasonable and Prudent Measures
SEL	Sound Exposure Level
SPCC	Spill Prevention, Control, and Countermeasure
SPL	Sound Pressure Level
SSL	Steller sea lion

SSV	Sound Source Verification
TL	Transmission Loss
TTS	Temporary Threshold Shifts
URS	URS Corporation
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WDPS	Western Distinct Population Segment
WQCP	Water Quality Control Plan
ZOE	Zone of Exclusion

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 are exempt from this general requirement 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 (16 U.S.C. § 1536(b)(4)).

For the actions described in this document, the action agencies are the NMFS Office of Protected Resources Permits and Conservation Division (PR1), which proposes to permit Marine Mammal Protection Act (MMPA) Level B take of the endangered western Distinct Population Segment (WDPS) Steller sea lion (*Eumetopias jubatus*) and the threatened Mexico Distinct Population Segment (DPS) humpback whale (*Megaptera novaeangliae*) in conjunction with construction activities at the Tenakee Springs Ferry Terminal (see Figure 1-2), and the Federal Highway Administration (FHWA), which proposes to fund this project. The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being carried out by the Alaska Department of Transportation and Public Facilities (ADOT&PF) pursuant to 23 U.S.C. § 326 and a Memorandum of Understanding dated September 18, 2015 and executed by FHWA and ADOT&PF. The consulting agency for this proposal is NMFS's Alaska Regional Office (AKR). This document represents NMFS's biological opinion (opinion) on the effects of this proposal on endangered and threatened species and designated critical habitat for those species.

The Tenakee Springs Ferry Terminal is a multi-function dock and active ferry terminal located in the center of town (Figure 3) and extends into Tenakee Inlet. The existing structure is in need of modifications as it is nearing the end of its operational life due to corrosion and wear. The purpose of the project is to replace the aging mooring and transfer structures with modern facilities that provide improved operations for Alaska Marine Highway System (AMHS) ferry vessels, as well as freight and fueling operators, servicing the community of Tenakee Springs. Planned improvements include the installation of new and renovation of existing shoreside facilities and marine structures to accommodate cargo and baggage handling, vessel mooring, passenger and vehicle access gangways, and re-establishment of existing electrical and fuel systems. Improvements will enhance public safety and security.

Planned improvements will not add any additional berths for vessels, and the existing capacity of the facilities will not be increased.

The new facility will continue to serve as the AMHS ferry terminal and will also support shipping and receiving of commercial and service-industry goods. Given the lack of road access to Tenakee Springs, the ferry terminal is an essential component of infrastructure, providing critical access between Tenakee Springs and the rest of the region.

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.

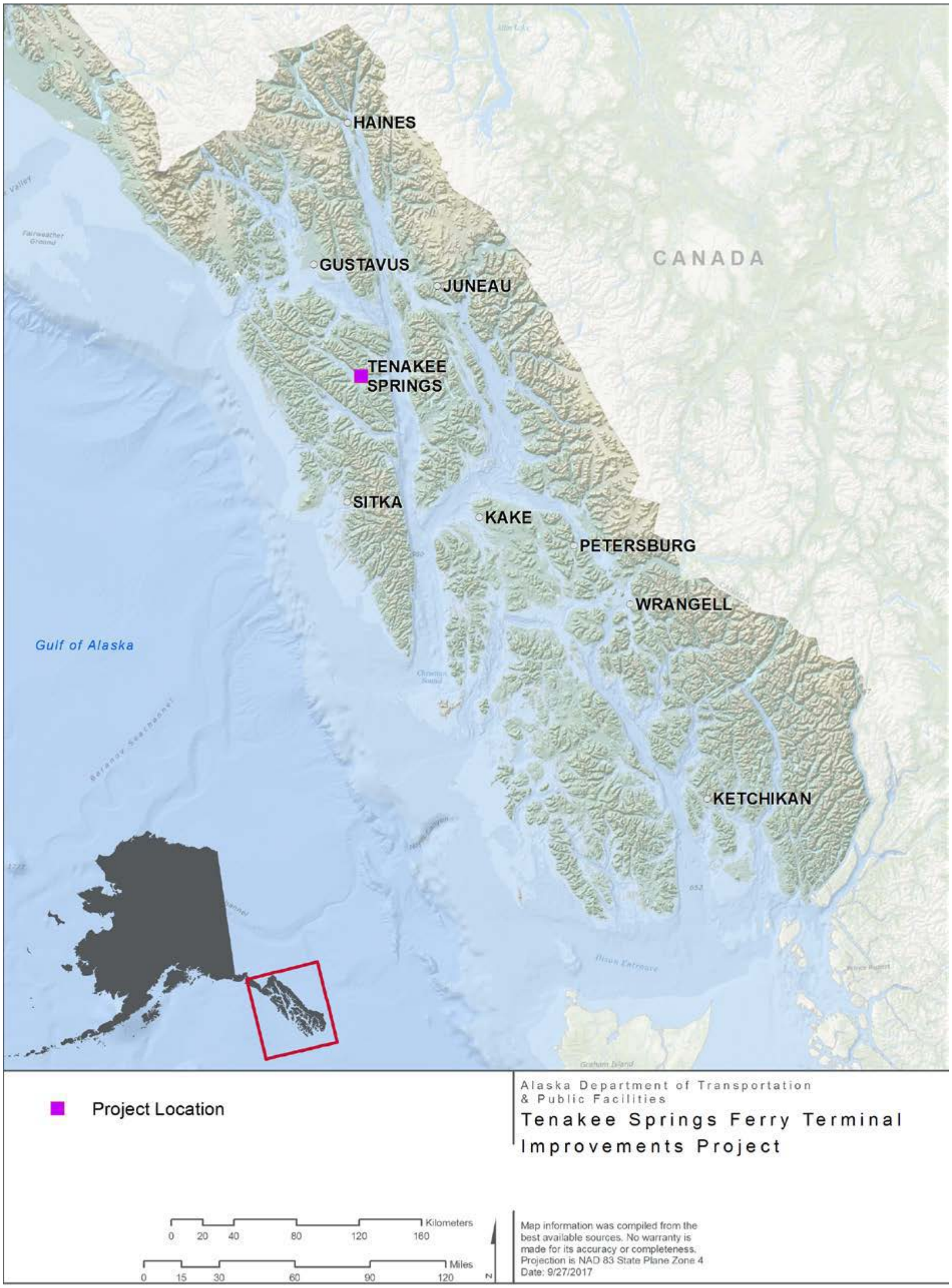

Figure 1. Area map of Tenakee Springs Ferry Terminal Improvements Project (HDR 2018a).

Figure 2. Image of the area around Tenakee Springs (HDR 2018a).

Figure 3. Existing Tenakee Springs Ferry Terminal located on the north shore of Tenakee Inlet (Note: the replacement ferry terminal would be constructed in the same location (ShoreZone, NOAA 2018).

1.1 Background

This opinion considers the effects of activities associated with ferry terminal improvements and maintenance in Tenakee Springs, Alaska and the associated proposed issuance of an Incidental Harassment Authorization (IHA). These actions have the potential to affect the endangered WDPS Steller sea lion, the threatened Mexico DPS humpback whale, and endangered sperm whale. Designated Steller sea lion critical habitat is not present within or near action area, and critical habitat has not been designated for the Mexico DPS humpback whale or sperm whale.

This opinion is based on information provided to us in the February 28, 2018 Biological Assessment (HDR 2018a), the Incidental Harassment Authorization application (HDR 2018b), emails and telephone conversations between NMFS Alaska Region, ADOT&PF, and NMFS PR1 staff; and other sources of information. A complete record of this consultation is on file at NMFS's Juneau, Alaska office.

On May 25, 2018, NMFS Alaska Region provided ADOT&PF and PR1 with a copy of the draft biological opinion. On June 5, 2018, ADOT&PF submitted comments on the draft opinion. NMFS Alaska Region reviewed all comments submitted and revised the opinion as warranted.

1.2 Consultation History

Our communication with PR1, ADOT&PF, and HDR, Inc. regarding this consultation is summarized as follows:

- **October 2, 2017**: NMFS AKR, PR1, ADOT&PF, and HDR, Inc. discussed upcoming project via conference call.
- **October 23, 2017**: PR1 received an initial draft Incidental Harassment Authorization (IHA) application from HDR, Inc. on behalf of ADOT&PF for non-lethal take of marine mammals incidental to a ferry terminal improvement construction project and forwarded to NMFS AKR.
- **October 30, 2017**: PR1 received a revised draft IHA and forwarded to NMFS AKR.
- **December 7, 2017**: NMFS AKR, PR1, ADOT&PF, and HDR, Inc. discussed take estimates via conference call.
- **January 30, 2018**: PR1 sent a revised draft IHA application.
- **February 28, 2018**: NMFS received a draft Biological Assessment (HDR 2018b) and a letter requesting initiation of formal consultation from ADOT&PF.
- **March 14, 2018**: PR1 submitted a request to initiate formal section 7 consultation.
- **March 21, 2018**: NMFS AKR deemed the initiation package complete and initiated consultation with PR1 and ADOT&PF.
- **March 22, 2018**: PR1 notified AKR that the IHA would have four small changes made to the application.
- **March 30, 2018**: NMFS sent a notice of Section 7 consultation request for information to the Alaska Department of Fish and Game.
- **April 2, 2018**: PR1 sent AKR the final draft IHA (RIN 0648-XF830)
- **April 4, 2018**: PR1 sent AKR notification that ADOT&PF modified the number of piles they are required to remove for the project. This does not impact the zone size nor does it impact the length of construction or take estimates.

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. "Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR §402.02).

This opinion considers the effects of modifying the Tenakee Springs ferry terminal, as well as the effects of issuing an IHA to take marine mammals by harassment under the MMPA incidental to the ferry terminal modifications in Tenakee Springs from June 1, 2019 through May 31, 2020.

Unless otherwise noted, all information contained within the *Description of the Proposed Action* is from the Biological Assessment (HDR 2018a) and the Incidental Harassment Authorization application (HDR 2018b).

The Tenakee Springs Ferry Terminal is located in the Village of Tenakee Springs, Alaska (57°46’45.6”N, 135°13’09.1”W), on Chichigof Island, on the north shore of Tenakee Inlet in southeast Alaska (see Figures 1-2).

The Tenakee Springs Ferry Terminal is an active ferry terminal located in Tenakee Inlet and provides the primary access point to the Village of Tenakee Springs. In 2016, there were an estimated 130 residents of Tenakee Springs. It is the second largest city on Chichagof Island. There is no road access to Tenakee Springs and therefore the ferry terminal provides essential access between Tenakee Springs and the rest of the region. Improvements and new construction will take place in the same location as the existing dock. A sea plane float is located immediately east of the ferry terminal and a small boat harbor is located approximately 700 meters east of the terminal (Figure 2).

The Village of Tenakee Springs is located on the north side of Tenakee Inlet, about 16 kilometers (km) (9.9 miles) west of where the Inlet opens to Chatham Strait. Tenakee Inlet is a long, narrow fjord with steep, rocky sides interspersed with extensive mudflats and intertidal zones. Water depths consistently reach 900 to 1,100 meters (2,950 to 3,600 feet) in the center of the Inlet, with at least one location deeper than 1,280 meters (4,200 feet). The shoreline is complex and meandering, interspersed with numerous coves, islands, and rocky outcroppings. Numerous rivers and creeks feed into the Inlet, contributing to the highly productive marine environment.

The Inlet supports abundant marine resources, including salmon, herring, crab, and shrimp. Marine mammals use the Inlet regularly, attracted to the rich foraging grounds. Humpback whales are seen bubble feeding in summer, and harbor seals haul out on rocky islets around the area.

Baseline background (ambient) sound levels in Tenakee Inlet are unknown. The areas around the existing ferry terminal are frequented by ferries, fishing vessels, and tenders; barges and tugboats; float planes; and other commercial and recreational vessels that use the small-boat harbor, city dock, and other commercial facilities.

The purpose of this proposed action is to make necessary modifications to the Tenakee Springs Ferry Terminal as the existing structure is nearing the end of its operational life due to corrosion and wear. The proposed action will replace the existing, aging mooring and transfer structures with modern facilities that provide improved operations for the Alaska Marine Highway System (AMHS) ferry vessels, as well as freight and fueling operators, servicing the community of Tenakee Springs. Planned improvements include: the installation of new and renovation of existing shoreside facilities and marine structures to accommodate cargo and baggage handling, vessel mooring, passenger and vehicle access gangways and re-establishment of existing electrical and fuel systems. A new pile-supported approach dock, city dock, ferry staging area, float-supported transfer bridge, and four dolphins would be constructed in approximately the same location as the existing structures. Improvements to the terminal and facilities will enhance public safety and security.

Fuel will be removed prior to decommissioning the fuel tank. The contractor is required to follow the Spill Prevention, Control and Countermeasures (SPCC) Plan requirements as follows: Prepare and implement an SPCC Plan when required by 40 CFR 112; when both of the following conditions are present on the project: 1) oil or petroleum products from a spill may reach navigable waters (as defined in 40 CFR 11); and 2) total above ground storage capacity for oil and any petroleum products is greater than 1,320 gallons (not including onboard tanks for fuel or hydraulic fluid used primarily to power the movement of a motor vehicle or ancillary onboard oil-filled operational equipment, and not including containers with a storage capacity of less than 55 gallons).

Planned improvements will not add any additional berths for vessels, and the existing capacity of the facility will not be increased. The new facility will continue to serve as the AMHS ferry terminal and will support shipping and receiving of commercial and service-industry goods.

There will be no dredging or removal of substrate, nor any deposition of fill or armor rock associated with the project. Construction would be conducted in accordance with the Clean Water Act (CWA) Section 404 and 401 regulations, to minimize potential construction-related impacts on water quality. Above-water construction will consist of the installation of concrete platform decking panels, utility lines, and a fuel building. The installed utility lines and pipelines will be connected to the platform, above marine waters, and no in-water noise is anticipated in association with their installation. Construction would adhere to all necessary storm water best management practices (BMPs) and State regulations to prevent impacts to adjacent marine waters (HDR 2018a). This would require the contractor to comply with the Water Quality Control Plan (WQCP). The WQCP is the contractor's detailed project specific plan to minimize erosion and contain sediment within the Project Zone, and to prevent discharge of pollutants that exceed applicable water quality standards.

2.1.1 Removal of Existing Facilities and Piles

The project includes the following components:

- Removal of the existing 12-foot by 240-foot approach dock decking and two 12.75-inch steel pipe piles;
- Removal of the existing city storage and fuel building and 42 14-inch pile-supported dock and timber fender piles;
- Removal of the existing city dock and berthing dolphin fenders and associated 26 14-inch steel pipe piles;
- Removal of the existing steel gangway float, platform, and five associated 18-inch steel pipe piles; and
- Removal of three, three-pile berthing and mooring dolphins and associated nine 16-inch steel piles.

The project will require the removal of approximately 86 piles of varying sizes and materials (Table 1). Not all existing structures and piles will be removed (Figure 4). It is anticipated that, when possible, existing piles will be extracted by directly lifting them with a crane. A vibratory hammer will be used only if necessary to extract piles that cannot be directly lifted. Removal of each old pile is estimated to require no more than 15 minutes of vibratory hammer use. Construction activities, including removal and installation of piles, would require both land-based and marine-based staging areas and construction equipment. Land-based equipment would be staged on the shore and in available storage areas on the existing dock. While work is conducted in the water, an anchored barge may be used to stage construction equipment.

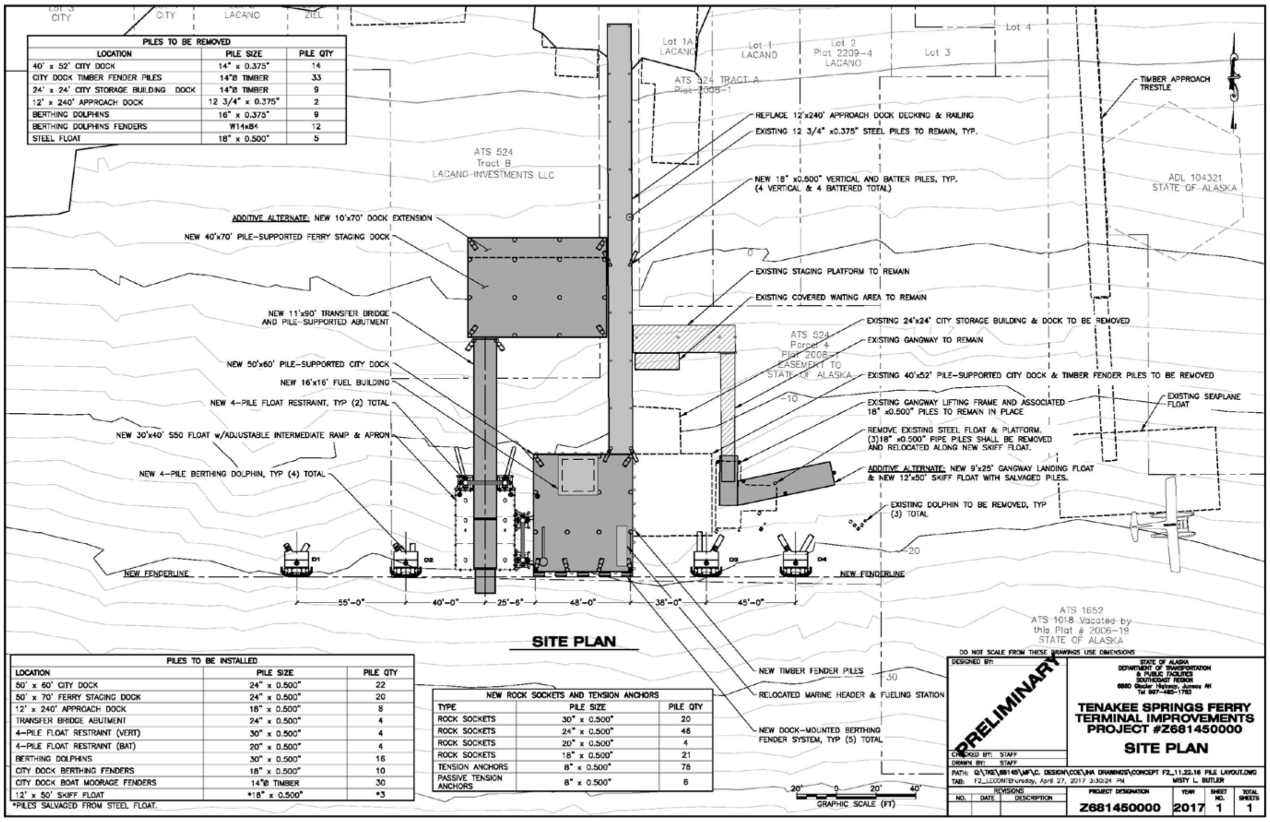

Figure 4. Tenakee Springs Ferry Terminal Improvements project site plan (HDR 2018a).

Table 1. Pile details and estimated effort required for pile removal (HDR 2018a).

Pile Diameter & Material	Project Component	Number of Piles	Total Number of Piles	Vibratory Duration Per Pile (min)	Estimated Total Number of Hours	Number of Piles Per Day (Range)	Days of Removal
12.75-inch Steel	Approach Dock	4	4	15	1.0	4	1
14-inch Timber	City Dock Fender Piles	33	42	15	10.5	5-10	9
	City Storage Building Dock	9					
14-inch Steel	City Dock	14	26	15	6.5	5-10	6

Pile Diameter & Material	Project Component	Number of Piles	Total Number of Piles	Vibratory Duration Per Pile (min)	Estimated Total Number of Hours	Number of Piles Per Day (Range)	Days of Removal
	Berthing Dolphin Fenders	12					
16-inch Steel	Berthing Dolphins	9	9	15	2.25	5-10	2
18-inch Steel	Steel Float	5	5	15	1.25	5	1
Totals			86		21		19

2.1.2 Construction of New Dock and Barge Landing

The project includes construction of the following components:

- A 12-foot by 240-foot approach dock (as noted in Section 2.1.1) and installation of additional steel support piles;
- A 50-foot by 70-foot pile-supported ferry staging dock;
- A 50-foot by 60-foot pile-supported dock with new fuel building and associated dock mounted fender system;
- An 11-foot by 90-foot steel transfer bridge and pile supported abutment;
- A steel bridge support float with adjustable intermediate ramp and apron with two four-pile berthing dolphins; and
- A ferry access skiff float and associated steel pipe pile restraints.

The project will require the installation of 121 piles of varying sizes and materials (Table 2). It is anticipated that an ICE model vibratory driver or equivalent and a Delmag D30 or Vulcan impact hammer, or equivalent, will be used to install the piles (HDR 2018a). The hammer model will be determined by the contractor. Initial installation of steel piles through the sediment layer may be done using vibratory methods for up to 15 minutes per pile. If the sediment layer is very thin, instead of vibratory methods, a few strikes from an impact hammer may be used to seat some steel piles into the weathered bedrock before drilling begins. It is possible that only an impact hammer and drilling will be used for some piles, and only a vibratory hammer and down-the-hole (DTH) hammering/drilling techniques will be used for other piles, depending on sediment conditions and as decided by the construction contractor. Following initial pile installation, the mud accumulation on the inside of the pile will be augered out (or cleaned through another method), as necessary, and allowed to accumulate around the base of the pile. Next, a hole (rock socket) will be drilled in the underlying bedrock by using a DTH drilling. A DTH hammer is a drill bit that drills through the bedrock and a pulse mechanism that functions at the bottom of the hole, using a pulsing bit to break up the rock to allow removal of the fragments and insertion of the pile. The head extends so that the drilling takes place below the pile. Drill cuttings are expelled from the top of the pile as dust or mud and allowed to settle at the base of the pile. It is estimated that drilling piles through the layered bedrock will take about 2–3 hours per pile.

Drilling will create a 10-foot-deep bedrock socket that holds the pile in place. The bedrock will attenuate noise production from drilling and reduce noise propagation into the water column. Additionally, the casing used during drilling acts like a cofferdam and will block noise, further reducing noise levels (82 *Federal Register* [FR] 34632; proposed IHA for the Gary Paxton Industrial Park Dock Modification Project in Sitka, Alaska). However, noise levels from drilling the bedrock socket to support piles will likely exceed the 120-decibel (dB) root mean square (rms) threshold for Level B harassment from continuous noise during at least a portion of the drilling.

If necessary after drilling, no more than 30 blows from an impact hammer will be used to confirm that piles are set into bedrock (proofed). Proofing will require approximately 5–10 minutes per pile.

Tension anchors will be installed on 86 of the 121 steel piles. In general, the farthest seaward piles will utilize tension anchors. To anchor each pile following pile installation, a 10-inch casing will be inserted into the center of the pile and an 8-inch rock anchor drill will be lowered into the casing and used to drill into bedrock. Rock fragments will be removed through the top of the casing as dust or mud and allowed to settle around the base of the pile on the sea floor. Lastly, the drill and casing will be removed, and an anchor attached by an anchor rod will be inserted into the hole. The hole will be filled with grout that will harden, thereby encapsulating the anchor in the bore hole and securing the pile and anchor to bedrock. Once installed, tension anchors are tightened, applying tension to the pile to prevent movement within the rock socket. Eight of the tension anchors will be passive, which means they will not be tightened. This will provide the pile with a small amount of play, which will allow the pile to move until it meets the extent of the tension anchor.

Installation of timber piles will use only an impact hammer, and will require approximately 75 strikes per pile, or approximately 20–30 minutes to install each pile. Pile installation activities will occur in waters from 0 to 36 feet (0 to 11 meters) deep within or immediately adjacent to the existing dock footprint.

Table 2. Pile details and estimated effort required for pile installation (HDR 2018a).

Pile Diameters & Material	Project Component	Number of Piles	Total Number of Piles	Vibratory Duration Per Pile (min)	Drilling Duration Per Pile (min)	Impact Strikes Per Pile	Estimated Total Number of Hours	Number of Piles Per day (range)	Days of Installation
24-inch Steel Piles	City Dock	22	46	15	120	30	107	2-3	23
	Ferry Staging Dock	20							
	Transfer Bridge Abutment	4							

Pile Diameters & Material	Project Component	Number of Piles	Total Number of Piles	Vibratory Duration Per Pile (min)	Drilling Duration Per Pile (min)	Impact Strikes Per Pile	Estimated Total Number of Hours	Number of Piles Per day (range)	Days of Installation
30-inch Steel Piles	Float Restraints (Vertical)	4	20	15	180	30	67	2-3	10
	Berthing Dolphins (Battered)	8							
	Berthing Dolphins (Vertical)	8							
20-inch Steel Piles	Float Restraints (Battered)	4	4	15	180	30	13	2-3	2
18-inch Steel Piles	Approach Dock	8	21	15	120	30	49	2-3	11
	Berthing Fenders	10							
	Skiff Float	3							
14-inch Timber Piles	Boat Moorage Fenders	30	30	NA	NA	75	10	5-10	6
8-inch Tension Anchors	Tension Anchors	78	86b	NA	60	NA	86	4-8	22
	Passive Tensions Anchors	8							
Totals			121				332		74

Note: Use of an impact hammer would be limited to 5-10 minutes per pile, if necessary.
NA = Not Applicable
[a] All 91 steel piles will require drilling.
[b] Tension anchors will be installed in a subset of piles and therefore are not included in the total number of piles.

2.1.3 Project and Pile Installation Schedule

Project construction, including pile installation and removal, would begin no sooner than 01 June 2019. Pile installation and removal is expected to take place over approximately 93 working days within a 4-month window. However, the exact dates are not known and will depend on numerous considerations including, but not limited to, contractor availability, ability to reduce potential impacts to ongoing operations, and weather. Given these unknown circumstances, the IHA application request is for a full year, from 01 June 2019 through 31 May 2020.

These time and schedule estimates are based on expected production rates shown in Tables 1 and 2. Different types of pile installation or removal may take place on the same day. Pile installation and removal would be intermittent and staggered over an estimated 4-month period depending on weather, construction and mechanical delays, marine mammal shutdowns, and other potential delays and logistical constraints.

2.1.4 Project Reconstruction Operations

Operations at the new dock would be identical those at the existing dock. The proposed action is not anticipated to result in increased ferry use, or other commercial or recreational vessel use in Tenakee Inlet. As described in Section 1 the proposed dock and associated facilities would be approximately the same size and located in approximately the same place as the existing dock.

2.1.5 Acoustic Sources

There are a number of acoustic sources associated with removal and replacement of dock, pile, and dolphin structures including: vibratory pile driving, impact pile driving, and DTH hammering. Each of these elements generates in-water and in-air noise depending on hammer type and size of pile (see Table 3 for additional resources).

Vibratory Hammer

Initial installation of steel piles through the sediment layer may be done using vibratory methods for up to 15 minutes per pile. It is possible that only an impact hammer and drilling will be used for some piles, and only a vibratory hammer and drilling will be used for other piles, depending on sediment conditions and as decided by the construction contractor. It is anticipated that an ICE model vibratory driver or equivalent will be used to install the piles. The hammer model will be determined by the contractor.

Impact Hammer

If the sediment layer is very thin, a few strikes from an impact hammer may be used to seat some steel piles into the weathered bedrock before drilling begins. An impact hammer is a steel device that works like a piston. The pile is first moved into position and set in the proper location using a choker cable or vibratory hammer. The impact hammer is held in place by a guide (lead) that aligns the hammer with the pile. A heavy piston moves up and down, striking the top of the pile and driving it into the substrate. If necessary after drilling, no more than 30 blows from an impact hammer will be used to confirm that piles are set into bedrock (proofed). Proofing will require approximately 5–10 minutes per pile. Installation of timber piles will use only an impact hammer, and will require approximately 75 strikes per pile, or approximately 20–30 minutes to install each pile. The proposed action anticipates using a Delmag D30 or Vulcan impact hammer, or equivalent, to install the piles (HDR 2018a). The hammer model will be determined by the contractor.

DTH Hydro-Hammering

In this project, the DTH hydro-hammer operates in vertical piles that have been partially driven by vibratory means. Although DTH hydro-hammering has impulsive source components, the high frequency of 1,100 blows/minute combined with long continuous operation intervals of several minutes make its signature noise more like a non-impulsive source and therefore we treat it as such in this opinion (Quijano and Austin 2017). Non-pulsed sounds may be either continuous or non-continuous. Some of the non-pulsed sounds can be transient signals of short duration, but without the essential properties of pulses (e.g., rapid rise time). The duration of such sounds, as received at a distance, can be greatly extended in a highly reverberant environment. Before it begins operating, the DTH hydro-hammer is installed within the hollow pipe pile at the bottom of the pile. Piles are advanced by applying a pulsating mechanism to break the underlying bedrock while simultaneously removing broken rock fragments. We have assumed that the interaction between the rock and the DTH hydro-hammer is what generates noise, therefore sound levels do not depend on pile diameter (ECO49 2017).

In May 2016, a Numa Patriot 180 hammer was used to drive 24 in diameter piles at a ferry terminal at Kodiak, AK (Warner and Austin 2016). Acoustic signatures for DTH hydro-hammering were recorded at ranges of 10–30 m from the pile. The measured source levels at each 1/3-octave-band from these measurements were adjusted by $20\log_{10}$(range) (i.e., back propagated assuming spherical spreading) and averaged to provide the representative 1/3-octave-band SEL, which were used for acoustic modeling at the Biorka Island Dock Project . The anticipated source level broadband SEL for DTH is 192 dB re 1 $uPa^2 \cdot s$ (Quijano and Austin 2017).

Table 3. Estimates of mean underwater sound levels generated during vibratory and impact pile driving, drilling, and vibratory pile removal (HDR 2018a).

Method and Pile Type	Installation, Removal, or Proofing	Sound Level at 10 meters	Literature Source
Vibratory Hammer		dB rms	
30-inch steel piles	Install	165.0	Derived from Warner and Austin 2016a & Denes *et al.* 2016
24-inch steel piles	Install	161.0	Navy 2012, 2015
20-inch steel piles	Install	161.0	Navy 2012, 2015
18-inch steel piles	Remove, Install	161.0	Navy 2012, 2015
16-inch steel piles	Remove	161.0	Navy 2012, 2015
14-inch steel piles	Remove	155.0	MacGillivray *et al.* 2015
14-inch timber piles	Remove, Install	155.0	MacGillivray *et al.* 2015
12.75-inch steel piles	Remove	155.0	MacGillivray *et al.* 2015
Drilling		dB rms	
30-inch steel piles	Install	165.0	Derived from Warner and Austin 2016b
24-inch steel piles	Install	165.0	Derived from Warner and Austin 2016b
20-inch steel piles	Install	165.0	Derived from Warner and Austin 2016b
18-inch steel piles	Install	165.0	Derived from Warner and Austin 2016b

Method and Pile Type	Installation, Removal, or Proofing	Sound Level at 10 meters			Literature Source
Impact Hammer		dB rms	dB SEL	dB peak	
30-inch steel piles	Proofing	194.7	180.8	208.6	Warner and Austin 2016a
24-inch steel piles	Proofing	193.0	181.0	210.0	Navy 2015 (from 82 FR 31400)
20-inch steel piles	Proofing	186.5	175.5	207.0	Caltrans 2015
18-inch steel piles	Proofing	158.0	-	174.0	Caltrans 2015
14-inch timber piles	Install	158.0	-	174.0	Caltrans 2015

2.1.6 Mitigation Measures

ADOT&PF has agreed to implement the following mitigation measures to minimize impacts to marine mammals, including ESA-listed species:

General Conditions

- ADOT&PF will ensure that briefings between construction supervisors and crews and the marine mammal monitoring team (discussed below) are conducted prior to the start of all pile driving and removal activity, and when new personnel join the work, to explain responsibilities, communication procedures, marine mammal monitoring protocol, and operational procedures.
- For in-water heavy machinery work other than pile driving, pile removal, or drilling while at anchor (*e.g.*, excavating material with a clamshell or another type of bucket, or placing fill material in the water), if a marine mammal comes within 100 meters, operations shall cease.
- For in-water heavy machinery work other than pile driving, pile removal, or drilling (*e.g.*, movement of the barge to the pile location and positioning the pile on the substrate via a crane, i.e., stabbing the pile), ADOT&PF shall implement a minimum shutdown zone of 100 meters and vessel operators shall reduce speed to the minimum level required to maintain steerage and safe working conditions.
- Work may only occur during daylight hours, when visual monitoring of marine mammals can be conducted.
- In-water pile installation/removal and drilling will shut down immediately if any species of marine mammal not covered by the IHA is sighted in the action area.

General Construction Activities

- If contaminated or hazardous materials are encountered during construction, all work near the contaminated site would be stopped until the Alaska Department of Environmental Conservation (ADEC) is contacted, and a corrective action plan is approved by ADEC and implemented.

- Fuel hoses, oil drums, oil or fuel transfer valves and fittings, and similar equipment would be checked regularly for drips or leaks, and would be maintained and stored properly to prevent spills.
- The contractor would provide and maintain a spill cleanup kit on-site at all times, to be implemented as part of Spill Prevention, Control, and Countermeasure (SPCC) Plan, as well as the Hazardous Material Control Plan (HMCP) and WQCP, in the event of a spill or if any oil products are observed in the water.
- Oil booms would be readily available for oil or other fuel spill containment should any release occur.
- All chemicals and petroleum products would be properly stored to prevent spills.
- No petroleum products, cement, chemicals, or other deleterious materials would be allowed to enter surface waters.

Exclusion and Disturbance Zones

Exclusion Zone (i.e., shutdown zone) – For all pile driving/removal and DTH hammering activities, the ADOT&PF will establish an exclusion zone intended to encompass the area within which sound pressure levels (SPLs) equal or exceed the auditory injury criteria for cetaceans and pinnipeds. The purpose of an 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 10. However, a conservative shutdown zone of 50 meters for pinnipeds and 100 meters for cetaceans will be used during monitoring to prevent any form of incidental Level A exposure for most species (Table 4). Additionally, during impact installation of 24-inch and 30-inch steel piles at a frequency of two or three piles per day, a conservative shutdown zone of 100 meters for WDPS Steller sea lions and 200 meters for and Mexico DPS humpback whales will be implemented (Table 4).

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 Protect Species Observers (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 *Proposed Monitoring and Reporting*). Nominal radial distances for disturbance zones are shown in Table 4.

Given the size of the disturbance zone for vibratory pile driving and DTH drilling (*e.g.,* 2.2-10 km), 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 stationed at Tenakee Springs) 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. 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 approximate understanding of actual total takes.

Table 4. Distances to Level A Exclusion and Level B Disturbance Zones (HDR 2018a).

Type of Pile	Distance to Level A Exclusion Zone (meters)		Level B Disturbance Zone (meters), Cetaceans and Pinnipeds[1]
	Humpback Whale	Steller Sea Lion	
Vibratory			
30-inch steel	100	50	10,000
24-inch steel, 20-inch steel, 18-inch steel	100	50	5,412
18-inch steel, 16-inch steel	100	50	5,412
14-inch steel, 14-inch timber, 12.75-inch steel	100	50	2,154
Drilling			
30-inch steel, 20-inch steel	100	50	10,000
24-inch steel, 18-inch steel	100	50	10,000
Impact			
30-inch steel	200	100	2,057
	200	100	
	200	100	
24-inch steel	200	100	1,585
	200	100	
	200	100	
20-inch steel	100	50	584
18-inch steel	100	50	7
14-inch timber	100	50	7
[1]Modeled radial distances for exclusion zones			

Shutdown Zone for Level A

- For all pile driving/removal and DTH drilling activities, ADOT&PF shall establish a shutdown zone. The purpose of a shutdown zone is generally 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). A conservative shutdown zone 50 meters for WDPS Steller sea lions and 100 meters for Mexico DPS humpback whales will be used during monitoring to prevent any form of incidental Level A exposure for most species. However, during impact installation of 24-inch and 30-inch steel piles at a frequency of two or three piles per day, the Level A harassment zone exceeds the 100-meter shutdown zone for low- and high frequency cetaceans (i.e., humpback whales). During these activities, PSOs will implement a 200-meter shutdown zone to avoid take of humpback whales. The placement of PSOs during all pile driving and drilling activities will ensure that the 200-meter shutdown zone is visible during impact installation of 24-inch and 30-inch steel piles.

Level B Disturbance Zone

- ADOT&PF will establish Level B disturbance zones or zones of influence (ZOI) which are areas where SPLs are equal to or exceed the 160 dB rms threshold for impact driving and the 120 dB rms threshold during vibratory driving and drilling. Monitoring zones provide utility for observing by establishing monitoring protocols for areas adjacent to the shutdown zones. Monitoring zones enable PSOs to be aware of and communicate the presence of marine mammals in the project area outside the shutdown zone and thus prepare for a potential cease of activity should the animal enter the shutdown zone. The Level B zones are depicted in Table 5. As shown, the largest Level B zone is equal to 78.9 km^2, making it difficult for the marine mammal observers to view the entire harassment area. Due to this, ADOT&PF will have PSOs record the area within which they are monitoring on a daily basis. The observations and area observed would then be used to estimate a density value that is used to extrapolate observed take to the unobserved area.

Table 5. Calculated areas ensonified within Level B harassment isopleths during drilling and pile installation and removal (HDR 2018a).

Type of Pile	Activity	Level B Harassment Zone (km2),
Vibratory		
30-inch steel	Install	78.9
24-, 20-., 18-, and 16-inch steel	Install	45.3
14-, 12.75-inch steel, and 14-inch timber	Remove	7.3
Drilling		
30-, 24-, 20-, and 18-inch steel	Install	78.9

Type of Pile	Activity	Level B Harassment Zone (km2),
Impact		
30-inch steel	Proofing	6.7
24-inch steel	Proofing	4.0
20-inch steel	Proofing	0.6
18-inch steel	Proofing	<0.1
14-inch timber	Install	<0.1

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, ADOT&PF will require an initial set of three strikes from the impact hammer at 40 percent energy, followed by a 30-second waiting period, then two subsequent three strike sets. 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) shall 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.

Monitoring and Reporting

Marine mammal monitoring shall 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 would be conducted 30 minutes before, during, and 30 minutes after pile driving and removal activities. In addition, PSOs shall record all incidents of marine mammal occurrence, regardless of distance from activity, and shall 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.
- PSOs would be land-based. A primary PSO would be placed at the terminal where pile driving would occur. A second PSO would range the uplands on foot or by ATV via Tenakee Ave., and go from Grave Point east of the harbor up and west of the project site to get a full view of the Level A zone and as much of the Level B zone as possible.
- PSOs would scan the waters using binoculars, and/or spotting scopes, and would use a handheld GPS or range-finder device to verify the distance to each sighting from the project site.

- All PSOs would 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 are 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 ADOT&PF will record detailed information about 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 ADOT&PF will attempt to distinguish between the number of individual animals taken and the number of incidences of take.

- A draft marine mammal monitoring report would 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. ADOT&PF will have PSOs record the area within which they are monitoring on a daily basis. The observations and area observed would 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 unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by the IHA, such as an injury, serious injury or mortality, ADOT&PF would immediately cease the specified activities and report the incident to the Protected Resources Division, NMFS, and the Alaska Regional Stranding Coordinator. The report would 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 would not resume until NMFS is able to review the circumstances of the prohibited take. NMFS would work with ADOT&PF to determine what is necessary to minimize the likelihood of further prohibited take and ensure ESA compliance. ADOT&PF would not be able to resume their activities until notified by NMFS via letter, email, or telephone.

2. In the event that ADOT&PF 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), ADOT&PF would 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 (mandy.migura@noaa.gov). The report would include the same information identified in the paragraph above. Activities would be able to continue while NMFS reviews the circumstances of the incident. NMFS would work with ADOT&PF to determine whether modifications in the activities are appropriate.

3. In the event that ADOT&PF 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), ADOT&PF would 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. ADOT&PF would provide photographs, video footage (if available), or other documentation of the stranded animal sighting to NMFS and the Marine Mammal Stranding Network.

Strike Avoidance

1. 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 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.

2.2 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.

For the proposed action, the basis for defining the action area takes into consideration:

1. The area in which construction activities will take place (see Figure 2); and
2. The ensonified area associated with both airborne and underwater construction-related noise associated with pile installation, pile removal, and drilling (see Table 3).

2.2.1 Aquatic Portion of the Action Area

The aquatic portion of the action area for the proposed project includes the maximum area within which project-related noise levels are expected to reach or exceed 120 dB re 1 μPa rms (henceforth 120 dB), i.e., ambient noise levels (where no measurable effect from the project would occur). Based on modeled sound propagation estimates, received levels from vibratory installation of 30-inch piles and DTH (the loudest noise source(s)) are expected to decline to 120 dB within a 10 km (6.2 mi) radius of the project location (HDR 2018a). The aquatic portion of the action area will be truncated where land masses obstruct underwater sound transmission, thus, the action area is largely confined to marine waters within Tenakee Inlet and encompasses approximately 10.5 km^2 (4.04 mi^2) (Figure 5).

2.2.2. In-Air Portion of the Action Area

Similar to the aquatic portion of the action area, the in-air portion of the action area is defined by the acoustic effects related to pile installation and drilling. Of the pile installation methods (vibratory and impact) and other construction equipment likely to be used (e.g., crane, dump truck, barge, bulldozer, excavator), impact installation of 30-inch steel pipe piles has the potential to affect the largest in-air geographic area due to the production of intermittent yet high-pressure noise. The maximum estimated distance that in-air noise would be detectable above background levels would be 1,143 meters (3,750 feet).

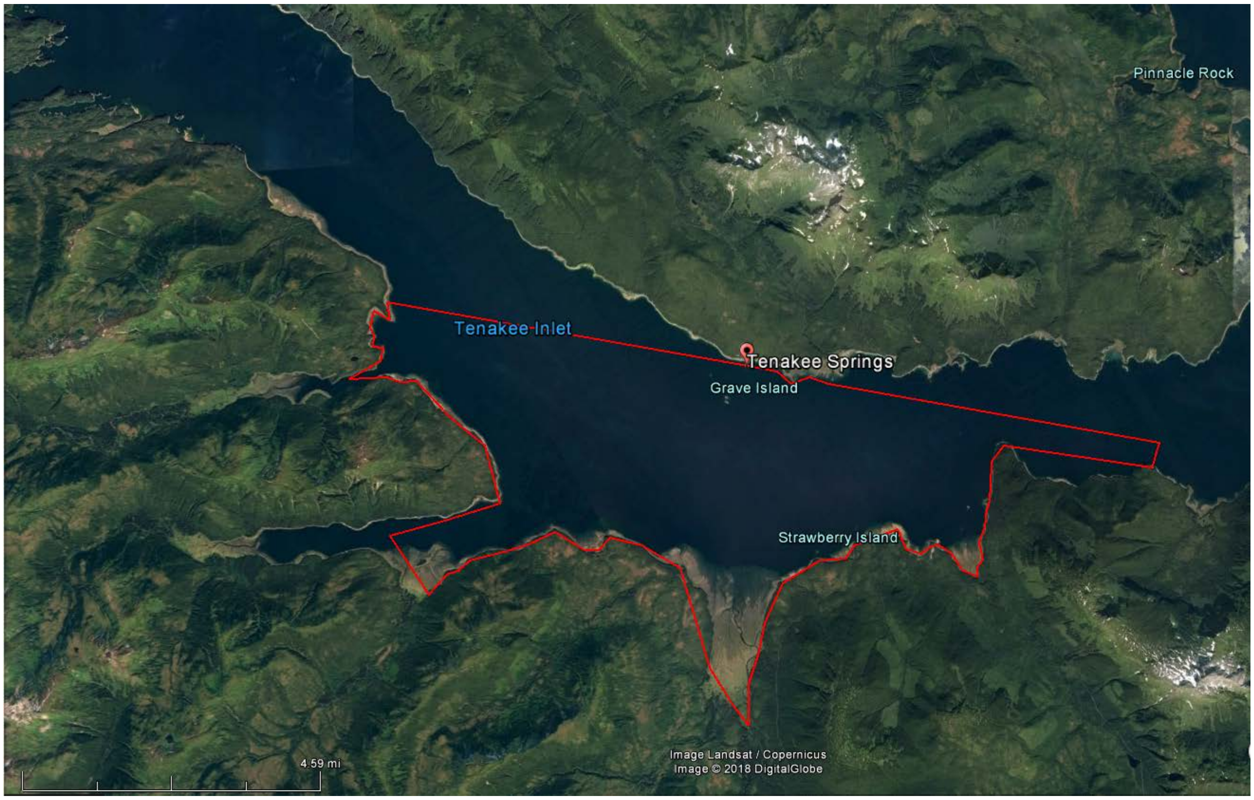

Figure 5. Tenakee Springs project action area map.

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(s) of critical habitat for WDPS Steller sea lions use(s) 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

Three species of marine mammals listed under the ESA under NMFS's jurisdiction may occur in the action area – WDPS Steller sea lions, Mexico DPS humpback whales, and sperm whales. No critical habitat occurs within the action area. This opinion considers the effects of the proposed action on these species (Table 6).

Table 6. 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	NMFS 1997, 62 FR 24345	1993 58 FR 45269
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	NMFS 1970, 35 FR 18319 NMFS 2016 81 FR 62260	Not designated
Sperm Whale (*Physeter microcephalus*)	Endangered	NMFS 1970 35 FR 18319	Not designated

4.1 Species and Critical Habitat Not Considered Further in this Opinion

NMFS uses two criteria to identify those endangered or threatened species or critical habitat that are likely to be adversely affected. The first criterion is exposure or some reasonable expectation of a co-occurrence between one or more potential stressors associated with ADOT&PF's proposed activities and a listed species or designated critical habitat. The second criterion is the probability of a response given exposure.

We applied these criteria to the species and critical habitats listed above and determined that the following species and designated critical habitats are not likely to be adversely affected by the proposed action: sperm whales and Steller sea lion critical habitat.

4.1.1 Sperm Whales

Tagged sperm whales have been tracked within the Gulf of Alaska, with two whales tracked within Chatham Strait, just off of Tenakee Inlet (SEASWAP 2017 http://seaswap.info/whaletracker/). Tagging studies primarily show that sperm whales use the deep water slope habitat extensively for foraging (Mathias *et al.* 2012). Interaction studies between sperm whales and the longline fishery have been focused along the continental slope of the eastern Gulf of Alaska in water depths between about 1,970 and 3,280 ft. (600 and 1,000 m) (Straley *et al.* 2005, Straley *et al.* 2014). The shelf-edge/slope waters of the Gulf of Alaska are far outside of the action area.

We do not expect that sperm whales will occur in the action area because they are generally found in deeper waters.

The acoustic stressors associated with the proposed action would have no effect on sperm whales because they are not anticipated to overlap in time and space, and the effects of ship strike are discountable because they are extremely unlikely to occur. Therefore, sperm whales are not likely to be adversely affected by this action.

4.1.2 WDPS Steller Sea Lion Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). The following Physical or Biological Feature (PBF)s were identified at the time of listing:

1. Alaska rookeries, haulouts, and associated areas identified at 50 CFR 226.202(a), including:
   - 1.1. Terrestrial zones that extend 914 m (3,000 ft.) landward
   - 1.2. Air zones that extend 914 m (3,000 ft.) above the terrestrial zone
   - 1.3. Aquatic zones that extend 914 m (3,000 ft.) seaward from each major rookery and major haulout east of 144° W. longitude
   - 1.4. Aquatic zones that extend 37 km (23 mi) seaward from each major rookery and major haulout west of 144° W. longitude
2. Three special aquatic foraging areas identified at 50 CFR 226.202(c):
   - 2.1. Shelikof Strait

2.2. Bogoslof

2.3. Seguam Pass

The action area does not overlap with designated critical habitat. The nearest critical habitat is Lull Point (Figure 6) located outside of the action area. During transit from staging areas to the construction site of Tenakee Springs Ferry Terminal, mitigation measures require all vessels associated with construction operations to avoid the 3,000 ft. (914 m) aquatic zone surrounding any designated critical habitat. In addition, Lull Point is more than 35 miles southeast of Tenakee Springs and is not in a direct access path from Tenakee Springs or other likely staging areas to the project site.

We conclude any impacts to these PBFs are likely to be insignificant. Therefore, we conclude Steller sea lion critical habitat is not likely to be adversely affected by this action.

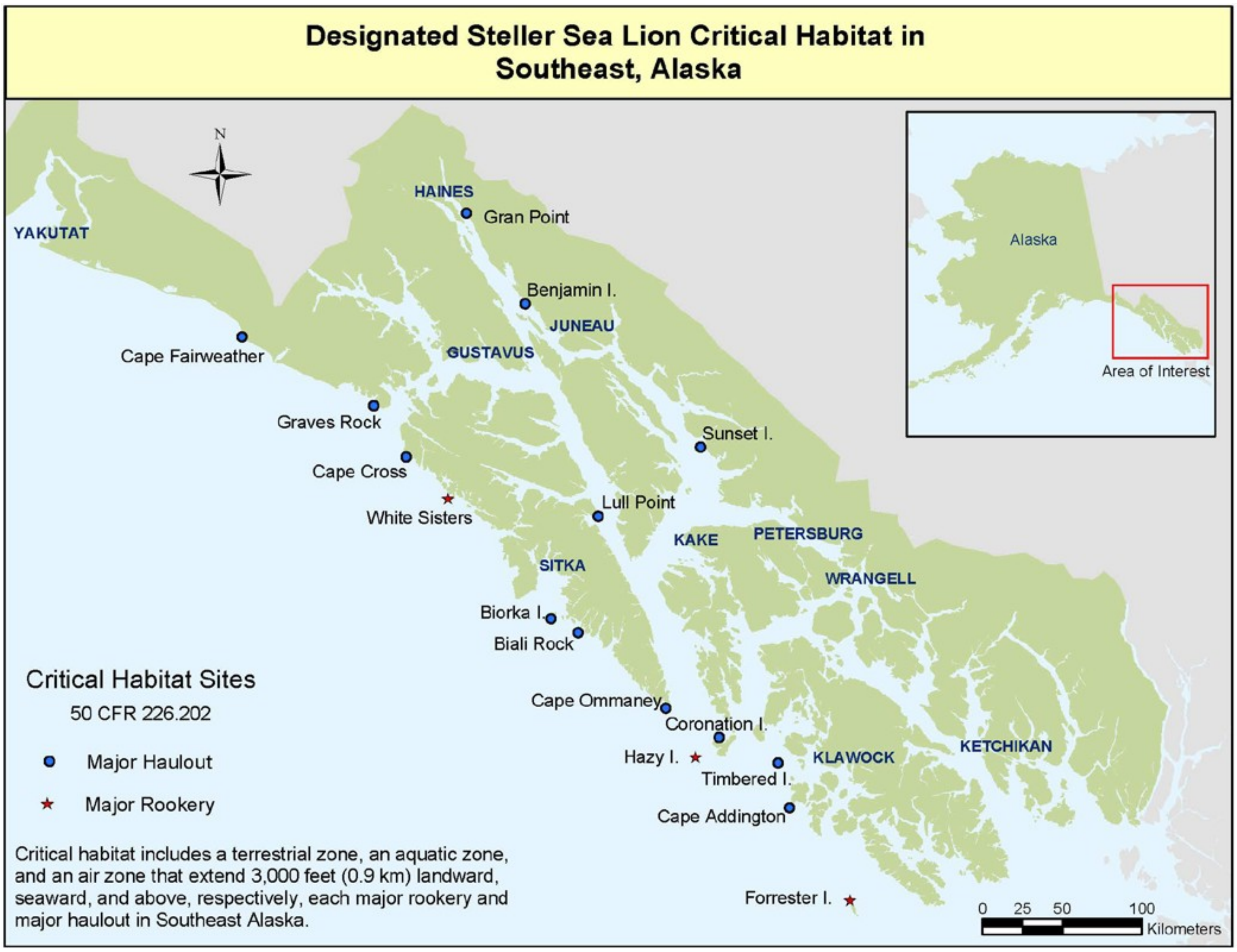

Figure 6. Designated critical habitat for Steller sea lions in Southeast Alaska.

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 direct and indirect effects of this short duration project (i.e., less than one year). We present an overview of the potential climate change effects on WDPS Steller sea lions and Mexico DPS 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 unequivocal, 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).

Climate change is likely to have its most pronounced effects on species whose populations are already in tenuous positions (Issac 2009). Therefore, we expect the extinction risk of at least some ESA-listed species to rise with global warming. Marine species ranges are expected to shift as they align their distributions to match their physiological tolerances under changing environmental conditions (Doney et al. 2012) . Cetaceans with restricted distributions linked to water temperature may be particularly exposed to range restriction (Issac 2009).

For ESA-listed species that undergo long migrations, if either prey availability or habitat suitability is disrupted by changing ocean temperature regimes, the timing of migration can change or negatively impact population sustainability (Simmonds and Eliott 2009). Low reproductive success and body condition in humpback whales may have resulted from the 1997/1998 El Niño (Cerchio *et al.* 2005).

The effects of these changes to the marine ecosystems of the Bering Sea, Aleutian Islands, and the Gulf of Alaska, 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).

As temperatures in the Arctic and subarctic waters are warming and sea ice is diminishing, there is an increased potential for harmful algal blooms that produce toxins to affect marine life (see Figure 7). Biotoxins like domoic acid and saxitoxin may pose a risk to marine mammals in Alaska. In addition, increased temperatures can increase *Brucella* infections. 905 marine mammals from 13 species were sampled including; humpback whales, bowhead whales, beluga whales, harbor porpoises, northern fur seals, Steller sea lions, harbor seals, ringed seals, bearded seals, spotted seals, ribbon seals, Pacific walruses, and northern sea otters. Domoic acid was detected in all 13 species examined and had 38% prevalence in humpback whales, and 27% in Steller sea lions. Additionally, fetuses from a beluga whale, a harbor porpoise and a Steller sea lion contained detectable concentrations of domoic acid documenting maternal toxin transfer in these species. Saxitoxin was detected in 10 of the 13 species, with the highest prevalence in humpback whales (50%) and 10% prevalence in Steller sea lions (Lefebvre *et al.* 2016).

Figure 7. Algal toxins detected in 13 species of marine mammals from southeast Alaska to the Arctic from 2004 to 2013 (Lefebvre *et al.* 2016).

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 Mexico DPS 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 would 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. The opinion also examines the condition of critical habitat throughout the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

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.

4.3.1 WDPS Steller Sea Lions

The Steller sea lion is classified within the Order Carnivora, Suborder Pinnipedia, Family Otariidae, and Subfamily Otariinae. The Steller sea lion is the only extant species of the genus *Eumetopias*.

Distribution

Steller sea lions are distributed throughout the northern Pacific Ocean, including coastal and inland waters in Russia (Kuril Islands and the Sea of Okhotsk), east to Alaska, and south to central California (Año Nuevo Island) (Figure 8). Animals from the eastern DPS occur primarily east of Cape Suckling, Alaska (144° W) and animals from the endangered WDPS occur primarily west of Cape Suckling. The WDPS includes Steller sea lions that reside primarily in the central and western Gulf of Alaska, Aleutian Islands, and those that inhabit and breed in the coastal waters of Asia (e.g., Japan and Russia). The eastern DPS includes sea lions living primarily in southeast Alaska, British Columbia, Washington, Oregon, and California.

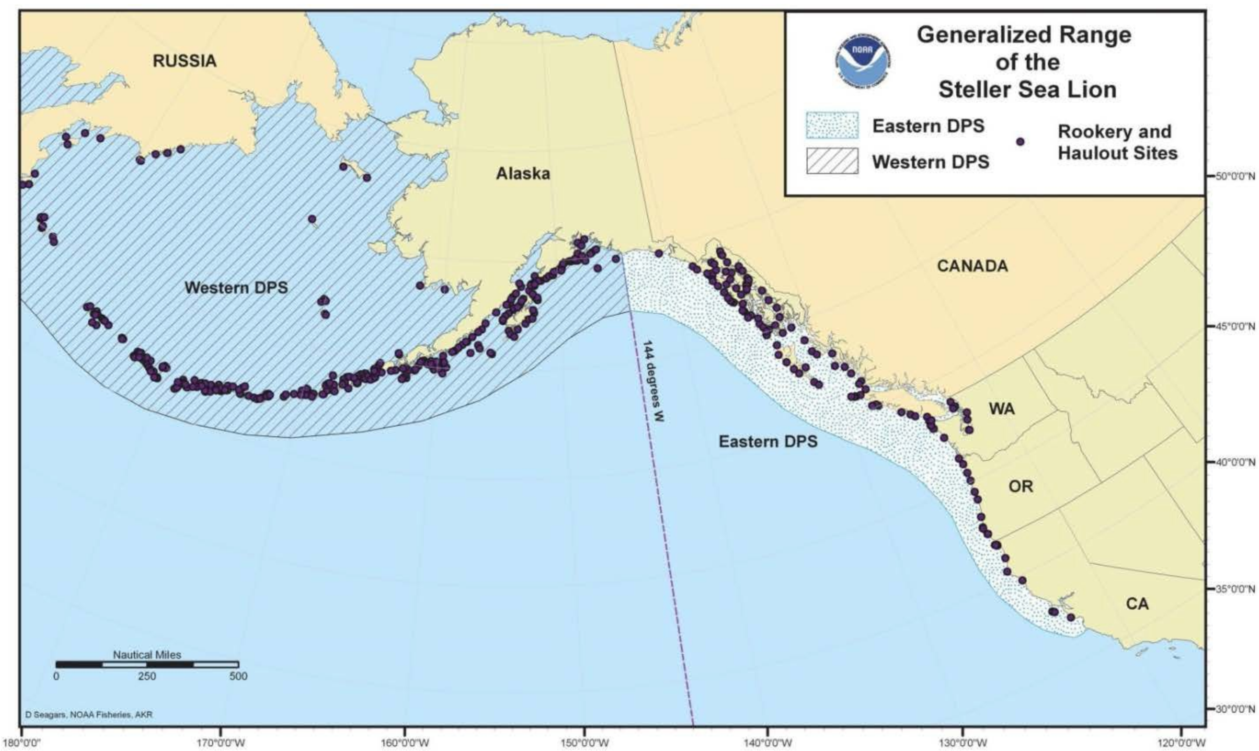

Figure 8. Generalized range of Steller sea lion, including rookery and haulout locations.

Within the action area, Steller sea lions are anticipated to be predominantly from the eastern DPS. However, studies have confirmed movement of animals across the 144° W longitude boundary (Raum-Suryan *et al.* 2002, Jemison *et al.* 2013), and some WDPS females have likely emigrated permanently and given birth at White Sisters and Graves rookeries in Southest Alaska. The vast majority of these sightings have been in northern Southeast Alaska, north of Sumer Strait.

Steller sea lions in the Action Area

Steller sea lions are known to occur within the project area; however, systematic counts or surveys have not been completed throughout Tenakee Inlet. Therefore, the best information regarding sea lion abundance and distribution comes from anecdotal reports from local residents and extrapolations from nearby haulouts that have been regularly monitored. Anecdotal reports from an employee of the existing ferry terminal fuel dock indicate that sea lions are generally present only in the fall and winter. Reports of these anecdotal observations also suggest that as many as 10–20 may swim by on a winter day, although most feed at night when their herring prey tend to be near the water's surface (Wheeler, K., pers. comm.).

The closest Steller sea lion haulout to the project area is the Tenakee Cannery Point haulout (Figure 9), which is approximately 8.9 kilometers (4.8 nautical miles) east of the project site (Fritz *et al.* 2016d).

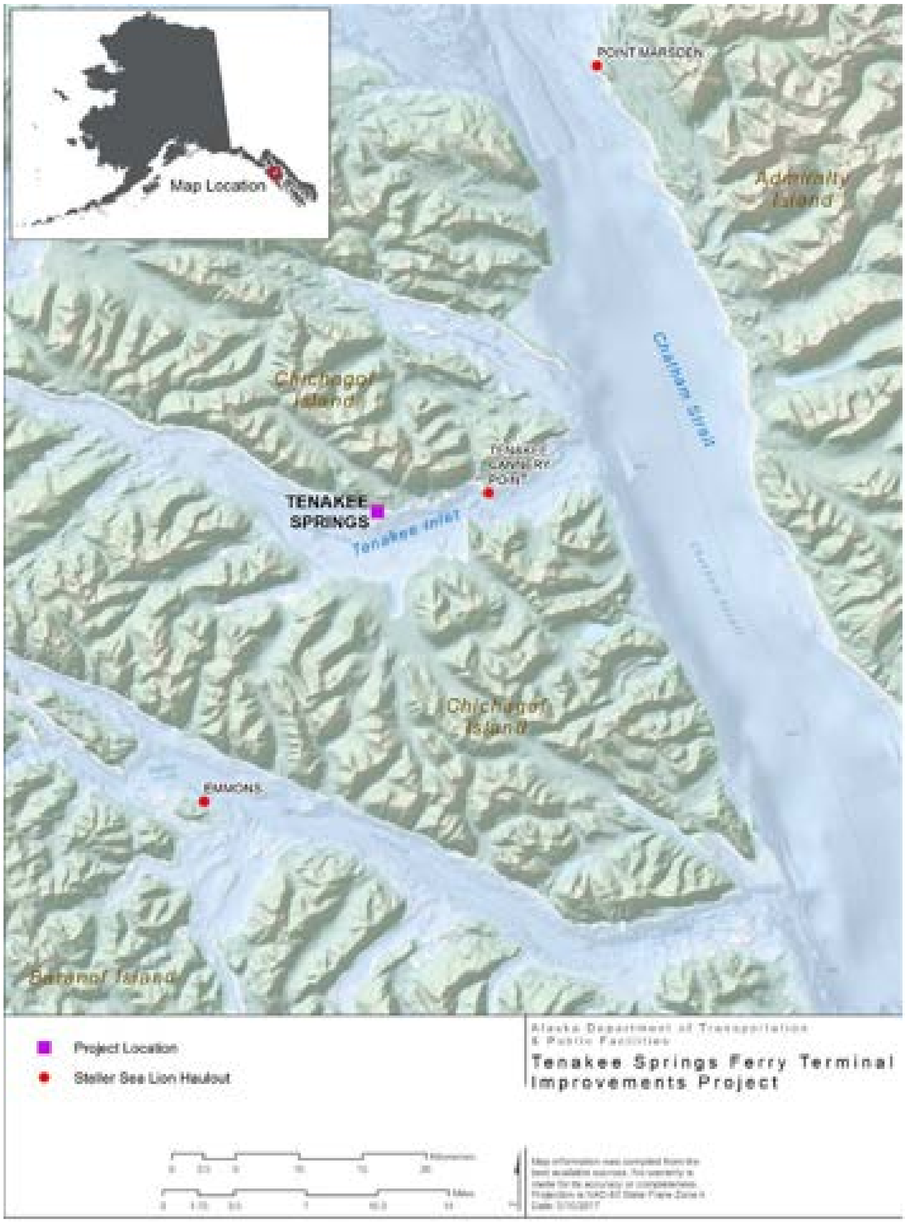

Figure 9. Steller sea lion haulouts located near Tenakee Springs, Alaska (Fritz *et al.* 2016a).

Life History

Steller sea lions are the largest of the eared seals (*Otariidae*), though there is significant difference in size between males and females: males reach lengths of 3.3 m (10.8 ft.) and can weigh up to 1,120 kg (2,469 lb.) and females reach lengths of 2.9 m (9.5 ft.) and can weigh up to 350 kg (772 lb.). Their fur is light buff to reddish brown and slightly darker on the chest and abdomen; their skin is black. Sexual maturity is reached and fist breeding occurs between 3 and 8 years of age. Implantation of the fertilized egg is delayed for about 3.5 months, and gestation occurs until the following May or June. Pups are born from late May to early July, with the peak of pupping occurring in June (Pitcher and Calkins 1981). Pups first enter the water two to four weeks after birth (Sandegren 1970) and once 2–3 months old, begin to disperse from the rookery

(Calkins and Pitcher 1982). As juveniles, they tend to disperse widely, but when they reach adulthood, generally remain within about 500 km of their natal rookery (Raum-Suryan *et al.* 2002).

Steller sea lions are opportunistic predators, feeding primarily on a wide variety of fishes and cephalopods including Atka mackerel (*Pleurogrammus monopterygius*), Pacific herring (*Clupea pallasi*), walleye pollock (*Gadus chalcogramma*), capelin (*Mallotus villosus*), Pacific sand lance (*Ammodytes hexapterus*), Pacific cod (*Gadus macrocephalus*), salmon (*Oncorhynchus* spp.), and squid (*Teuthida* spp.) (Jefferson *et al.* 2008, Wynne *et al.* 2011). Figure 10 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 (Womble *et al.* 2009).

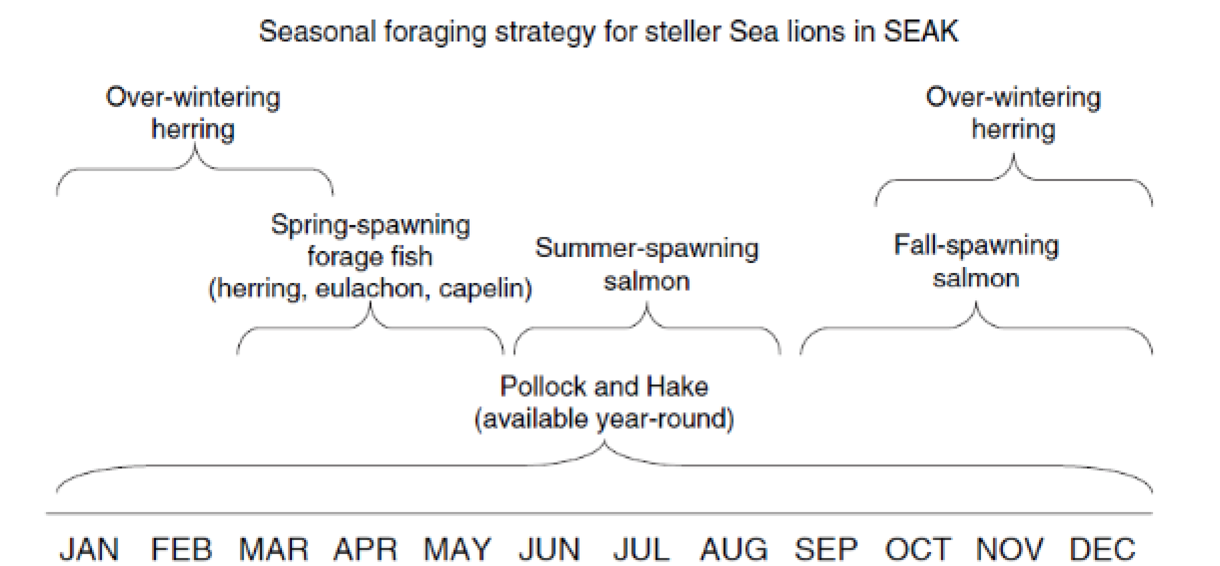

Figure 10. Seasonal foraging ecology of Steller sea lions. (Reproduced with permission from Womble *et al.* 2009).

Most adult Steller sea lions occupy rookeries during pupping and breeding season (late May-early July). During the breeding season, most juvenile and non-breeding adults are at haulouts, though some occur at or near rookeries. Adult females and pups continue to stay on rookeries through August beginning a regular routine of alternating foraging trips at sea with nursing their pups on land. During the non-breeding season, many Steller sea lions disperse from rookeries and increase their use of haulouts. Steller sea lions do not migrate, but they often disperse widely outside of the breeding season (Loughlin 1997). At sea, Steller sea lions commonly occur near the 200 m (656 ft.) depth contour, but have been seen from near shore to well beyond the continental shelf (Kajimura and Loughlin 1988).

The ability to detect sound and communicate underwater and in-air 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 and 39 kHz in water (NMFS 2016c). 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 (Muslow and Reichmuth 2008). 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).

Additional information on Steller sea lions can be found at: https://alaskafisheries.noaa.gov/pr/steller-sea-lions.

Population Dynamics

The WDPS population declined approximately 75% from 1976 to 1990 (the year of ESA listing). Since 2000, the abundance of the WDPS has increased, but there has been considerable regional variation in trend (Muto *et al.* 2017). The minimum population estimate of WDPS Steller sea lions in Alaska is 50,983 individuals. Using data collected through 2015, there is strong evidence that non-pup and pup counts of WDPS Steller sea lions in Alaska increased at ~2% per year between 2000 and 2015 (Muto *et al.* 2017). However, there are strong regional differences across the range in Alaska, with positive trends east of Samalga Pass (~170°W) in the Gulf of Alaska and eastern Bering Sea and negative trends to the west in the Aleutian Islands (Muto *et al.* 2017).

Movement of animals between the western and eastern stocks of Steller sea lions may affect population dynamics and patterns of underlying genetic variation. A small portion of Steller sea lions throughout Alaska are branded as pups and the brand remains visible throughout their lives. By surveying haulouts and rookeries and documenting branded animals, it is possible to track branded individuals through space and time. Studies of branded animals have confirmed movement of animals across the EDPS and WDPS boundary (Raum-Suryan *et al.* 2002, Fritz *et al.* 2013, Jemison *et al.* 2013). Jemison *et al.* (2013) reported regularly occurring temporary movements of WDPS Steller sea lions across the 144° W longitude boundary. Fritz *et al.* (2016a) estimated an average annual movement of WDPS Steller sea lions to southeast Alaska of 1,039 animals. Studies indicate the females from both stocks have produced pups at Southeast Alaska rookeries (Jemison *et al.* 2013). These rookeries are outside of this project's action area.

Recent summer counts have not recorded any Steller sea lions at the Tenakee Cannery Point haulout, and historical counts between April and September have not exceeded 12 individuals during any survey (Fritz *et al.* 2016b). This haulout appears to be most active between October and March (Figure 11), which is consistent with anecdotal reports of sea lion abundance in the project area (Rasanen, L., pers. comm.; Wheeler, K., pers. comm.). Non-pup counts conducted between October and March from 2001 to 2004 averaged 106 individuals and ranged from 16 to 251 (Fritz *et al.* 2016b). Jemison (2017, unpublished data) indicated that the average winter (October to March) abundance was 140 sea lions at the haulout. Pups have not been counted at this haulout (Fritz *et al.* 2016c). In addition to those counted at the haulouts, as many as a few hundred more sea lions occur throughout Tenakee Inlet in small hunting groups (Rasanen, L., pers. comm.). The Point Marsden and Emmons haulouts are also located within 20 nautical miles of Tenakee Springs, but it is unlikely that individuals from those haulouts regularly inhabit

Tenakee Inlet. Experts with the Alaska Fisheries Science Center of NMFS estimate that roughly 17.8 percent of the Steller sea lions at the Tenakee Cannery Point haulout are members of the WDPS (L. Fritz, pers. comm; L. Fritz, unpublished data).

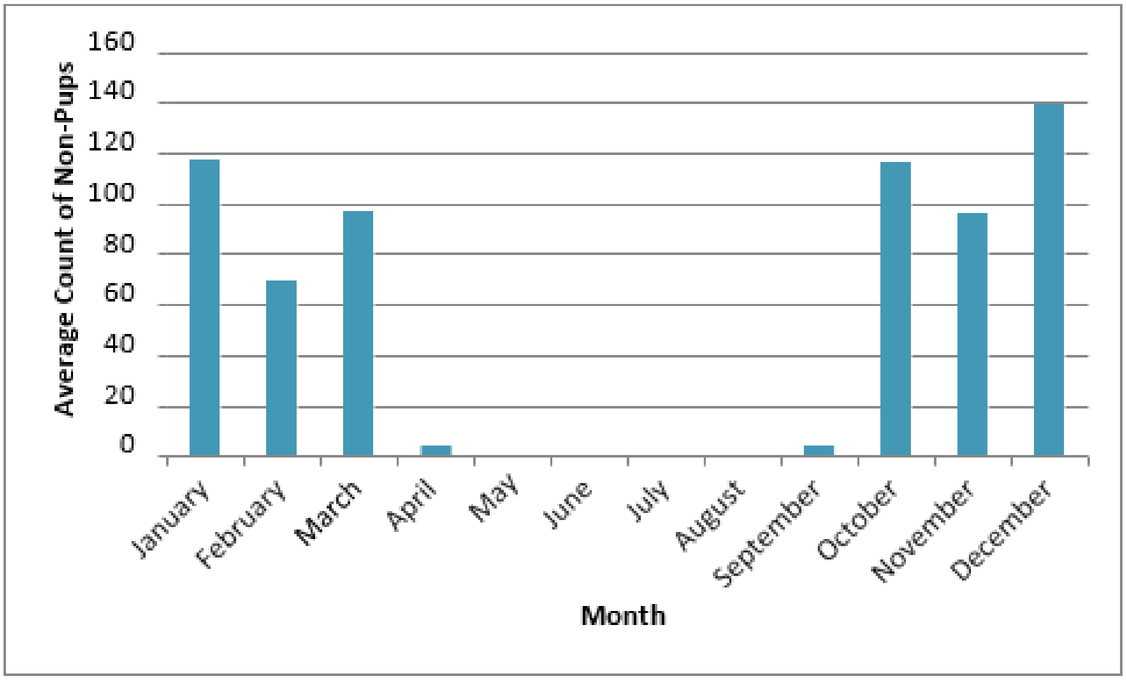

Figure 11. Average monthly Steller sea lion non-pup counts at Tenakee Cannery Point haulout 1982-2015 (Fritz *et al.* 2016b).

Status

The Steller sea lion was listed as a threatened species under the ESA on November 26, 1990 (55 FR 49204). In 1997, NMFS reclassified Steller sea lions as two DPSs based on genetic studies and other information (62 FR 24345); at that time the eastern DPS was listed as threatened and the WDPS was listed as endangered. On November 4, 2013, the eastern DPS was removed from the endangered species list (78 FR 66139). Factors affecting the continued existence of the WDPS at the time of its listing included changes in the availability or quality of prey as a result of environmental changes or human activities and shootings of Steller sea lions. Concern about possible adverse effects of contaminants was also noted.

Steller sea lions are included in Alaska subsistence harvests. Since subsistence harvest surveys began in 1992, the number of households hunting and harvesting sea lions has remained relatively constant at low levels (Wolfe *et al.* 2013).

Additional threats to the species include environmental variability, competition with fisheries, predation by killer whales, toxic substances, incidental take due to interactions with active fishing gear, illegal shooting, entanglement in marine debris, disease and parasites, and disturbance from vessel traffic, tourism, and research activities. Principal threats to the species in the action area are discussed below.

Critical Habitat

NMFS designated critical habitat for Steller sea lions on August 27, 1993 (58 FR 45269). More information about critical habitat can be found in Section 4.1.2 of this opinion.

Threats

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 recent Alaska Groundfish Biological Opinion (NMFS 2014a).

NATURAL THREATS

Killer Whale Predation

The Steller Sea Lion Recovery Plan (NMFS 2008) 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 (Maniscalco *et al.* 2007, Dahlheim and White 2010, Horning and Mellish 2012).

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% (Heise 2003) and 5% (NMFS 2014b) of the remains found in deceased killer whale stomachs in the GOA, depending on the specific study results. Matkin (2012) estimated the abundance of transient killer whales in the eastern GOA to be 18. Maniscalco *et al.* (2007) identified 19 transient killer whales in Kenai Fjords from 2000 through 2005 and observed killer whale predation on six pup and three juvenile Steller sea lions. Maniscalco *et al.* (2007) estimated that 11 percent 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 and concluded that GOA transient killer whales were having a minor impact on the recovery of the sea lions in the area.(Maniscalco *et al.* 2007). Maniscalco *et al.* (2008) further studied Steller sea lion pup mortality using remote video at Chiswell Island. Pup mortality up to 2.5 months postpartum averaged 15.4 percent, 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.

Other studies in the Kenai Fjords/Prince William Sound region have also found evidence for high levels of juvenile Steller sea lion mortality, presumably from killer whales. 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 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 evidence exists to indicate that sharks prey on Steller sea lions. The Steller Sea Lion Recovery Plan did not rank shark predation as a threat to the recovery of the WDPS (NMFS 2008). Sleeper shark and sea lion home ranges overlap (Hulbert *et al.* 2006) and one study suggested that predation on Steller sea lions by sleeper sharks may be occurring (Horning and Mellish 2012). 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. Overall, Steller sea lions are unlikely prey for sleeper sharks (Sigler *et al.* 2006).

Disease and Parasites

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked diseases and parasites as a low threat to the recovery of the WPDS.

Environmental Variability

The Steller Sea Lion Recovery Plan ranks environmental variability as a potentially high threat to recovery of the WDPS (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 (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.* 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.* 2009, IPCC 2013).

ANTHROPOGENIC THREATS

Fishing Gear and Marine Debris Entanglement

Although 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, 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 Alaska Department of Fish and Game and NMFS, Helker *et al.* (2016) reported Steller sea lions to be the most common species of human-caused mortality and serious injury between 2010 and 2014. There were 468 cases of serious injuries to EDPS Steller sea lions from interactions with fishing gear from and marine debris. 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. Over the same period, the WDPS mostly interacted with observed trawl (66) and some longline (3) groundfish fisheries, typically resulting in death. The minimum estimated mortality rate of western Steller sea lions incidental to all U.S. commercial fisheries is 33.2 sea lions per year, based on PSO data (31) and stranding data (2.2) where PSO data were not available. Several fisheries that are known to interact with the WDPS have not been observed reaching the minimum estimated mortality rate (Allen and Angliss 2016).

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.

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 this stock for all areas except St. Paul in 2004-2008 (172) combined with the mean annual take for St. Paul in 2010-2014 (29) is 201 western Steller sea lions (Muto *et al.* 2017).

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. There have been no cases of illegal shooting successfully prosecuted since 1998 (NMFS, Alaska Enforcement Division), although the NMFS Alaska Stranding Program documents 60 Steller sea lions with suspected or confirmed firearm injuries from 2000 – 2016 in Southeast Alaska.

On June 1, 2015, the NMFS AKR Stranding Response Program received reports of at least five dead Steller sea lions on the Copper River Delta. Two NMFS biologists recorded at least 18 pinniped carcasses, most of which were Steller sea lions, on June 2, 2015. A majority of the carcasses had evidence that they had been intentionally killed by humans. Subsequent surveys resulted in locating two additional Steller sea lions, some showing evidence suggestive that they had been intentionally killed. Therefore, NMFS Alaska Region designed a 2016 survey plan for the Copper River Delta focused on the time period of greatest overlap between the salmon driftnet fishery and marine mammals. The purpose of the surveys was to determine if the intentional killing observed in 2015 continued, and to collect cause of death evidence and samples for health assessments. Intentional killing by humans appears to be continuing and was the leading cause of death of the pinnipeds NMFS assessed on the Copper River Delta from May 10 to August 9, 2016. Without continuous monitoring in past years, it is impossible to know if the lack of reported carcasses in the decade prior to 2015 accurately reflects past intentional killings by humans. Numbers of marine mammals found dead with evidence of human interaction dropped between 2015 and 2017, but intentionally killing is still occurring (Wright 2018).

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.

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 is not likely affecting population dynamics in the WDPS.

Risk of Vessel Strike

NMFS Alaska Region Stranding Program has records of three occurrences of Steller sea lions being struck by vessels in Southeast Alaska; all were near Sitka. 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). Toxic substances can affect animals in two major ways. First, the acute toxicity caused by a major point source of a pollutant (such as an oil spill or hazardous waste) can lead to acute mortality or moribund animals with a variety of neurological, digestive and reproductive problems. Second, toxic substances can impair animal populations through complex biochemical pathways that suppress immune functions and disrupt the endocrine balance of the body, causing poor growth, development, reproduction and reduced fitness. Sea lions exposed to oil spills may become contaminated with PAHs through inhalation, dermal contact and absorption, direct ingestion, or by ingestion of contaminated prey (Albers and Loughlin 2003).

Climate Change and Ocean Acidification

Marine ecosystems are susceptible to impacts from climate change and ocean acidification linked to increasing CO2 emissions including increasing global anthropogenic CO2 emissions. As discussed in the Fishery Management Plan (FMP) Opinion (NMFS 2010b), there is strong evidence that ocean pH is decreasing and that 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 FMP Opinion (NMFS 2010a) 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 Mexico DPS Humpback Whales

Distribution

Humpback whales are widely distributed in the Atlantic, Indian, Pacific, and Southern Oceans. Individuals generally migrate seasonally between warmer, tropical and sub-tropical waters in winter months (where they reproduce and give birth to calves) and cooler, temperate and sub-

Arctic waters in summer months (where they feed). In their summer foraging areas and winter calving areas, they tend to occupy shallower, coastal waters; though during seasonal migrations they disperse widely in deep, pelagic waters and tend to avoid shallower coastal waters (Winn and Reichley 1985).

Humpback whales are found throughout Southeast Alaska in a variety of marine environments, including open-ocean, near-shore waters, and areas with strong tidal currents (Dalheim *et al.* 2009). Most humpback whales are migratory and spend winters in the breeding grounds off either Hawaii or Mexico, but some individuals have been documented over-wintering near Sitka and Juneau (NPS Fact Sheet available at http://www.nps.gov/glba). 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 area (Baker 1985, Straley 1990).

Humpback Whales in the Action Area

Within the action area, humpback whales are seen most frequently from September through February although sightings may extend into April (Straley and Pendell 2017). Humpback whales generally arrive in southeast Alaska in March and return to their wintering grounds in November. Some humpback whales depart late or arrive early to feeding grounds, and therefore the species occurs in southeast Alaska year-round (Straley 1990). Across the region, there have been no recent estimates of humpback whale density, and there have been no systematic surveys of humpback whales in or near the project area. Marine mammal experts in the region have indicated that there are as many as 12 humpbacks present in Tenakee Inlet from spring through fall. During the winter, they are less common, but are regularly present (S. Lewis and M. Dahlheim, pers. comm.).

Life History

Humpback whales are large baleen whales that are primarily dark grey in appearance, with variable areas of white on their fins, bellies, and flukes. The coloration of flukes is unique to individual whales. The lifespan of humpback whales is estimated to be 80 to 100 years. Sexual maturity is reached at five to 11 years of age. The gestation period of humpback whales is 11 months, and calves are nursed for 12 months. The average calving interval is two to three years. Birthing occurs in low latitudes during winter months.

Humpback whale feeding occurs in high latitudes during summer months. Southeast Alaska provides important humpback foraging areas in summer and fall (Figure 12). Humpback whales exhibit a wide range of foraging behaviors and feed on a range of prey types, such as small schooling fishes, krill, and other large zooplankton.

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

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. 1970b, 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).

Social sounds in breeding areas associated with aggressive behavior in male humpback whales are very different than songs and extend from 50 Hz to 10 kHz (or higher), with most energy in components below 3 kHz (Tyack and Whitehead 1983, Silber 1986). These sounds appear to have an effective range of up to 9 km (Tyack and Whitehead 1983).

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–5 kHz with estimated source levels from 144– 174 dB; these are mostly sung by males on the breeding grounds (Winn et al. 1970a, Richardson et al. 1995, Au 2000, Frazer and Mercado 2000, Au et al. 2006a);
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).

Additional information on humpback whales can be found at:
http://www.nmfs.noaa.gov/pr/species/mammals/whales/humpback-whale.html

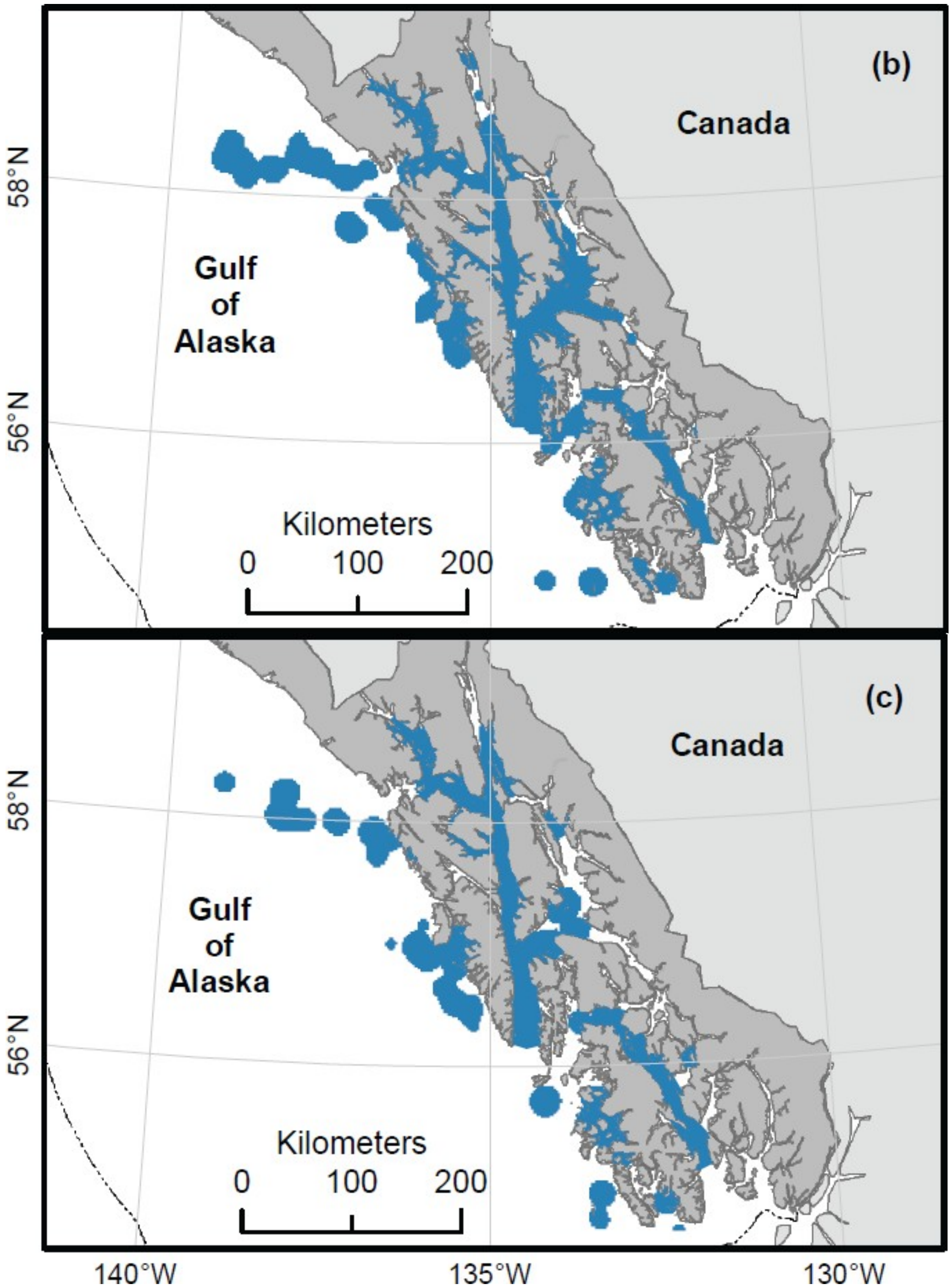

Figure 12. Seasonal humpback whale biologically important feeding areas in Southeast Alaska for (b) summer (June-August), and fall (September-November) (Ferguson *et al.* 2015), showing overlap with the action area.

Population Dynamics

NMFS recently conducted a global status review and changed the status of humpback whales under the ESA (81 FR 62260; September 8, 2016). Under the final rule, 14 DPSs of humpback whales are recognized worldwide:

- North Atlantic
  - West Indies
  - Cape Verde Islands/Northwest Africa
- North Pacific
  - Western North Pacific
  - Hawaii
  - Mexico
  - Central America
- Northern Indian Ocean
  - Arabian Sea
- Southern Hemisphere
  - Brazil
  - Gabon/Southwest Africa
  - Southeast Africa/Madagascar
  - West Australia
  - East Australia
  - Oceania
  - Southeastern Pacific

Humpback whales in the action area may belong to the Mexico or Hawaii DPSs (81 FR 62260).

The worldwide population of all humpback whales is estimated to be approximately 75,000 individuals. Population trends are not available for all humpback whale stocks or populations due to insufficient data, but growth appears to be positive in most areas. The most recent minimum population estimate of the central North Pacific stock is 7,890 whales with an estimated grown rate of 5.5 to 6.0 percent (Muto *et al.* 2017).

In the final rule changing the status of humpback whales under the ESA (81 FR 62260; September 8, 2016), the abundances of the Mexico and Hawaii DPSs throughout their range were estimated to be 3,264 (CV = 0.06) and 11,398 (CV = 0.04) whales, respectively. The Mexico DPS has an unknown trend. The growth rate of the Hawaii DPS was estimated to be between 5.5 and 6.0 percent.

Within Southeast Alaska and northern British Columbia, the abundance estimate for humpback whales is estimated to be 6,137 (CV= 0.07) animals which includes whales from the Hawaii DPS (93.9%) and Mexico DPS (6.1%) (NMFS 2016a, Wade *et al.* 2016).

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 (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 SPLASH project (Structure of Populations, Levels of Abundance and Status of Humpbacks). 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, Hawaii, Mexico, and Central America. 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 7 below (NMFS 2016a).

Table 7. 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 I/Bering/Chukchi	4.4%	86.5%	11.3%	0%
Gulf of Alaska	0.5%	89%	10.5%	0%
Southeast Alaska / Northern BC	0%	93.9%	6.1%	0%
Southern BC / WA	0%	52.9%	41.9%	14.7%
OR/CA	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.

As described in the Population Dynamics Section, humpback whales in the action area may belong to the Mexico or Hawaii DPSs. Whales from these two DPSs overlap on feeding grounds off Alaska, and are not easily distinguishable.

The Mexico DPS (which includes a small proportion of humpback whales found in the Aleutian Islands, Bering Sea, Chukchi Sea, Beaufort Sea, Gulf of Alaska, and Southeast Alaska) is listed as threatened, and the Hawaii DPS (which includes most humpback whales found in the Aleutian Islands, Bering Sea, Chukchi Sea, Beaufort Sea, Gulf of Alaska, and Southeast Alaska) is not listed.

The humpback whale species was originally listed as endangered because of past commercial whaling. Subsistence hunters in Alaska are not authorized to take humpback whales.

Additional threats to the species include vessel strikes and disturbance, fisheries interactions (including entanglement) and noise. Principal threats to the species are discussed further below.

Critical Habitat

Critical habitat has not been designated for Mexico DPS humpback whales, and therefore is not analyzed in this Opinion.

Threats

Brief descriptions of threats to humpback whales follow. More detailed information can be found in the Humpback Whale Recovery Plan (NMFS 1991) (available at http://www.nmfs.noaa.gov/pr/pdfs/recovery/whale_humpback.pdf), the NMFS Stock Assessment Reports (available at http://www.nmfs.noaa.gov/pr/sars/species.htm), the Global Status Review (Fleming and Jackson, 2011) (available at https://alaskafisheries.noaa.gov/sites/default/files/globalreview0311.pdf), and the ESA Status Review (Bettridge *et al.* 2015) (available at http://www.nmfs.noaa.gov/pr/species/Status%20Reviews/humpback_whale_sr_2015.pdf).

NATURAL THREATS

Killer Whale Predation

Humpback whales are killed by killer whales (Whitehead and Glass 1985, Dolphin 1987, Florezgonzalez *et al.* 1994, Naessig and Lanyon 2004). While killer whale attacks of humpback whales are rarely observed (Ford and Reeves 2008), the proportion of photo-identified whales bearing rake scars is between zero and 40%, with the greater proportion of whales showing mild scarring (1-3 rake marks) (Steiger *et al.* 2008). This indicates that attacks by killer whales on humpback whales vary in frequency across regions and either that most killer whale attacks result in mild scarring or that those resulting in severe scarring (four or more rakes, parts of fluke missing) are more often fatal. Most observations of humpback whales under attack from killer whales reported vigorous defensive behavior and tight grouping where more than one humpback whale was present (Ford and Reeves 2008). Calves 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).

Shark Predation

There is also evidence of shark predation on calves and entangled whales (Mazzuca *et al.* 1998). Shark bite marks on stranded whales may often represent post-mortem feeding rather than predation, i.e., scavenging on carcasses (Long and Jones 1996).

Disease and Parasites

Out of 13 marine mammal species examined in Alaska, domoic acid was detected in all species examined with humpback whales 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

Range-wide anthropogenic threats to humpback whales include: vessel strikes, fishery interactions including entanglement in fishing gear, subsistence harvest, illegal whaling or resumed legal whaling, pollution, and acoustic disturbance (NMFS 1991, Fleming and Jackson 2011, Bettridge *et al.* 2015). Vessel strikes (Fleming and Jackson 2011), and fishing gear entanglement (Fleming and Jackson 2011, Bettridge *et al.* 2015) are listed as the main threats and sources of anthropogenic impacts to humpback whale DPSs in Alaska.

Vessel Strikes and Disturbance

Vessel strikes often result in life-threatening trauma or death for cetaceans. Impact is often initiated by forceful contact with the bow or propeller of the vessel. Ship strikes on humpback whales are typically identified by evidence of massive blunt trauma (fractures of heavy bones and/or hemorrhaging) in stranded whales, propeller wounds (deep slashes or cuts into the blubber), and fluke/fin amputations on stranded or live whales (Fleming and Jackson 2011).

Between 2010 and 2014, mean annual mortality and serious injury due to strikes from charter, recreational, research, and unknown vessels to Central North Pacific humpback whales in Alaska was 2.7 whales (Allen and Angliss 2016). Most of the vessel collisions were reported in Southeast Alaska (Helker *et al.* 2016), but it is unknown whether the difference in ship strike rates between Southeast Alaska and other areas is due to differences in reporting, amount of vessel traffic, densities of whales, or other factors (Allen and Angliss 2016).

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 of 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.

Fishery Interactions including Entanglements

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. From 1979-2008, 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 since 1980, four of which are known to have died (Ford *et al.* 2009, COSEWIC 2011).

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. Gray, beluga, bowhead, fin, and sperm whales have also been reported as entangled in Alaska waters over the past decade. 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.

Subsistence, Illegal Whaling, or Resumed Legal Whaling

There are no reported takes of humpback whales from the Mexico DPS by subsistence hunters in Alaska or Russia for the 2008-2012 period (Allen and Angliss 2015). A humpback whale was taken opportunistically and without authorization by subsistence hunters near Toksook Bay in 2016, but was likely not from the Mexico DPS. As a result, NMFS has expanded outreach to western Alaska communities about the legal requirements for harvesting whales under the Whaling Convention Act.

Pollution

Humpback whales can accumulate lipophilic compounds (e.g., halogenated hydrocarbons) and pesticides (e.g. DDT) in their blubber, as a result either of feeding on contaminated prey (bioaccumulation) or inhalation in areas of high contaminant concentrations (e.g. regions of atmospheric deposition) (Barrie *et al.* 1992, Wania and Mackay 1993).

Acoustic Disturbance

Anthropogenic sound has increased in all oceans over the last 50 years and is thought to have doubled each decade in some areas of the ocean over the last 30 or so years (Croll *et al.* 2001, Weilgart 2007). Low frequency sound comprises a significant portion of this and stems from a variety of sources including shipping, research, naval activities, and oil and gas exploration. Understanding the specific impacts of these sounds on mysticetes, and humpback whales specifically, is difficult. However, it is clear that the geographic scope of potential impacts is vast, as low-frequency sounds can travel great distances under water.

It does not appear that humpback whales are often involved in strandings related to noise events. There is one record of two humpback whales found dead with extensive damage to the temporal bones near the site of a 5,000-kg explosion, which likely produced shock waves that were responsible for the injuries (Weilgart 2007). Other detrimental effects of anthropogenic noise include masking and temporary threshold shifts (TTS). These processes are described in detail later in this document.

5. ENVIRONMENTAL BASELINE

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

5.1 Factors Affecting Species within the Action Area

A number of human activities have contributed to the current status of populations of ESA-listed species in the action area. The factors that have likely had the greatest impact are discussed in the sections below. For more information on all factors affecting the ESA-listed species considered in this opinion, please refer to the following documents:

- "Alaska Marine Mammal Stock Assessments, 2016" (Muto *et al.* 2017).
  - Available online at http://www.nmfs.noaa.gov/pr/sars/pdf/ak_2016_final_sars_june.pdf
- "Recovery Plan for the Steller Sea Lion, Eastern and Western Distinct Population Segments (*Eumetopias jubatus*)" (NMFS 2008)
  - Available online at https://alaskafisheries.noaa.gov/sites/default/files/sslrpfinalrev030408.pdf
- "Status Review of the Humpback Whale (*Megaptera novaeangliae*)" (Bettridge *et al.* 2015)
  - Available online at: http://www.nmfs.noaa.gov/pr/species/Status%20Reviews/humpback_whale_sr_2015.pdf

5.1.1 Past and Present Disturbances in the Action Area

Within the action area, past and ongoing development in Tenakee Inlet has resulted in modified habitat along shorelines and nearshore habitats, which may to a limited extent affect prey species for ESA-listed species in the action area (Figure 5). Development, modifications to existing infrastructure and vessel traffic have the potential to contribute to degradation of the aquatic baseline through a reduction of foraging habitat and increased disturbance due to noise and vessel presence. Another public use dock is located within 50 meters (164 feet) of the Tenakee Springs ferry terminal. This dock is frequently used by float planes, including regularly scheduled commercial flights, and includes a helicopter landing pad. The small boat harbor is located approximately 700 meters (2,297 feet) to the east of the ferry terminal. Overhead flights and regular use by commercial as well as recreational vessels have likely contributed noise to both the in-air and underwater acoustic baselines in the action area. Outside Tenakee Inlet and beyond the action area, cruise ships and container vessels regularly transit through Chatham Strait (HDR 2018a).

There are two State-owned public docks at Tenakee Springs, the existing AMHS ferry terminal and the Tenakee Seaplane Base. The Tenakee Seaplane Base is a general aviation non-commercial airport that averaged 54 aircraft takeoffs and landings per month in 2015, the last year for which data is available (Airnav 2018). The City of Tenakee Springs oversees the small boat harbor (HDR 2018a).

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 the ferry terminal and Tenakee Inlet are frequented by fishing vessels and tenders; AMHS ferries; occasional barges; floatplanes; 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.

Noise Related to Construction Activities

NMFS has conducted numerous ESA section 7 consultations related to construction activities in Southeast Alaskan waters. Many of the consultations have authorized the take (by harassment) of humpback whales and Steller sea lions from sounds produced during pile driving, drilling, and vessel operations.

In 2017, NMFS conducted three consultations with the Permits Division on the issuance of IHAs to take marine mammals incidental to dock and ferry terminal construction in Southeast Alaska (Sawmill Cove Dock, Gustavus Ferry Terminal, and Haines Ferry Terminal). The incidental take statements in the three biological opinions estimated 797 WDPS Steller sea lions and 45 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}. Only one Level A harassment of a Mexico DPS humpback whale was 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).

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 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 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).

Fisheries

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

The minimum estimate of the mean annual mortality and serious injury rate incidental to U.S. commercial fisheries for the entire Central North Pacific stock in 2010-2014 is 7.4 humpback whales, based on observer data from Alaska (Muto *et al.* 2017).

Commercial fisheries may indirectly affect whales and pinnipeds by reducing the amount of available prey or affecting prey species composition. In Alaska, commercial fisheries target known prey species of ESA-listed whales and pinnipeds, such as pollock and cod.

The most recent minimum average annual estimated mortality and serious injury rate of WDPS Steller sea lions associated with observed commercial fisheries is 30 individuals (Muto *et al.* 2017). The minimum average annual mortality and serious injury rate for all fisheries, based on observer data (30 sea lions) for commercial fisheries and stranding data (1.6 sea lions) for unknown (commercial, recreational, or subsistence) fisheries is 32 WDPS Steller sea lions (Muto *et al.* 2017).

Harvest

Commercial whaling in the 19th and 20th centuries removed tens of thousands of whales from the North Pacific Ocean. As discussed in Section 4.3.2 of this opinion, commercial harvest was the primary factor for ESA-listing of humpback whales. This historical exploitation has affected populations and distributions of humpback whales in the action area, and it is likely these impacts will continue to persist into the future.

Subsistence hunters in Alaska have reported one subsistence take of a humpback whale in South Norton Sound in 2006. There had not been any additional reported takes of humpback whales from this stock by subsistence hunters in Alaska or Russia until 2016 when hunters illegally harvested one near Toksook Bay in May (DeMarban and Demer 2016).

As of 2009, data on community subsistence harvest are no longer being collected for Steller sea lion; therefore, the most recent estimate of annual statewide (excluding St. Paul Island) harvest[1] is 172 individuals from the 5-year period from 2004 to 2008. More recent data from St. Paul are available; the mean annual harvest is 29 sea lions from the 5-year period from 2010 to 2014 for a total of 201 Steller sea lions/year (Muto *et al.* 2017).

Pollutants and Discharges

Previous development and discharges in portions of the action area are the source of multiple pollutants that may be bioavailable (i.e., may be taken up and absorbed by animals) to ESA-listed species or their prey items (NMFS 2013).

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

Vessel Interactions

Ship strikes and other interactions with vessels unrelated to fisheries occur frequently with humpback whales. 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 (Figure 13). Eighty-six percent of these reports involved humpback whales. The minimum mean annual mortality and serious injury rate due to ship strikes reported in Alaska is 2.7 Central North Pacific humpback whales per year between 2010 and 2014. Most vessel collisions with humpbacks are reported from Southeast Alaska (Muto *et al.* 2017).

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[1] These numbers included both harvested and struck and lost sea lions.

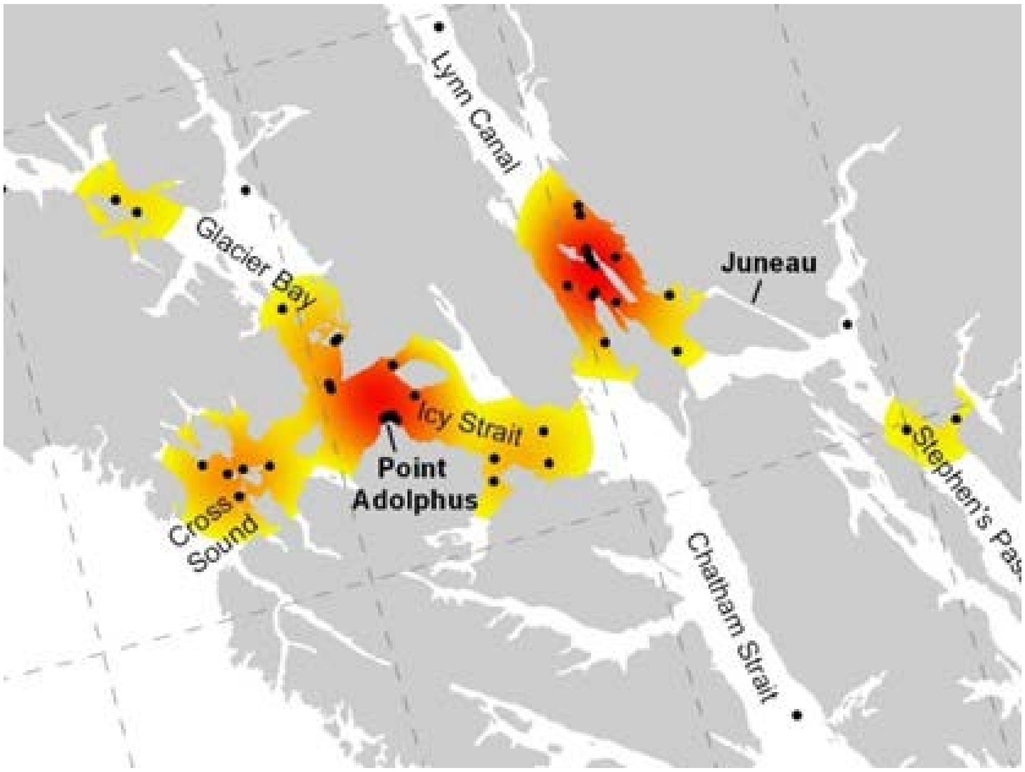

Figure 13. High risk areas for vessel strike in northern Southeast Alaska. (Used with permission from Neilson *et al.* 2012).

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:

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

In addition to the voluntary marine mammal viewing guidelines discussed previously, many of the marine mammal viewing tour boats voluntarily 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. These practices include slowing speeds near whales, limiting time spent with whales, enhancing communication and education on the water, and promoting responsible advertising. More information is available at https://whalesense.org/.

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, another 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.

There are three documented occurrences of Steller sea lions being struck by vessels in Southeast Alaska; all were near Sitka. Although risk of ship strike has not been identified as a significant concern for Steller sea lions (Loughlin and York 2000) recovery plan for this species states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated (e.g., near rookeries or haulouts)(NMFS 2008).

The 3-mile no transit zones are established and enforced around rookeries in the area for further protection, and NMFS's guidelines for approaching marine mammals discourage vessels approaching within 100 yards of haulout locations. There is no designated critical habitat for Steller sea lions within the action area.

Environmental Baseline Summary

Historically, overexploitation of large whales caused declines in abundance to the point of near-extinction. There is no commercial whaling of humpback whales currently.

The relationship between sound and marine mammal response to sound is the topic of extensive scientific research and public inquiry. Most observations report only short-term behavioral responses that include cessation of feeding, resting, or social interactions because study design precludes detection of difficult-to-detect long-term effects, if any exist. However, behavioral response could take the form of localized habitat abandonment, which could have implications at the population level.

Humpback whales and WDPS Steller sea lions in the action area appear to be increasing in population size – or, at least, their population sizes do not appear to be declining – despite their continued exposure to the direct and indirect effects of the activities discussed in the Environmental Baseline. While we do not have trend information for the Mexico DPS of humpback whales, they also do not appear to be declining because of the current stress regime.

6. EFFECTS OF THE ACTION

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

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

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

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

6.1 Project Stressors

Based on our review of the Biological Assessment (HDR 2018a), the IHA application (HDR 2018b), personal communications, and available literature as referenced in this opinion, our analysis recognizes that the proposed construction activities at the Tenakee Springs Ferry Terminal may cause these primary stressors:

- Airborne noise from:
    - Pile driving and pile removal
    - Down-the-hole hammering
- Underwater noise from:
    - Pile driving and pile removal
    - Down-the-hole hammering
    - Vessels (tugboats and barges)
- Vessel strike
- Disturbance to seafloor
- 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 impulsive and continuous noise sources because these stressors will likely have the most direct impacts on listed species.

6.1.1 Stressors Not Likely to Adversely Affect ESA-listed Species

Based on a review of available information, we determined which of the possible stressors may occur, but for which the likely effects are discountable or insignificant.

1. *Vibratory and Impact Pile Driving and DTH Drilling Airborne Noise*

Pinnipeds that occur near the project site could be exposed to airborne sounds associated with pile driving and removal and DTH drilling that have the potential to cause behavioral harassment, depending on their distance from pile driving activities. Cetaceans are not expected to be exposed to airborne sounds that would result in harassment as defined under the MMPA. Airborne noise will primarily be an issue for pinnipeds that are swimming or hauled out near the project site within the range of noise levels elevated above the acoustic criteria.

The project component that is expected to generate the most in-air noise is impact installation of 30-inch steel piles. However, measurements of in-air noise from impact installation of 30-inch piles were not available; therefore, noise measurements from installation of 48-inch piles were used as a proxy. Measurements of in-air noise resulting from impact installation of 48-inch piles were collected for two different hammers during the 2016 Test Pile Program for the Anchorage Port Modernization Program (i.e., Port of Alaska [POA] Modernization Program). In-air noise levels during impact installation with the hydraulic hammer were the highest at 102.5 dB (HDR 2018a) and this value was chosen as a conservative estimate for impact installation of 30-inch steel piles at Tenakee Springs (Table 8).

Table 8. Estimates for in-air sound levels generated during pile installation (HDR 2018a).

Method and Pile Type	Sound Level (dB) at 15 meters	Source
Diesel Impact Hammer 48-inch permanent steel pipe	101.0	POA 2016
Hydraulic Impact Hammer 48-inch permanent steel pipe	102.5	POA 2016

In-air thresholds for harbor seals is 90 dB re 20 µPa, and 100 dB re 20 µPa for all other pinnipeds. While impact driving 30-inch piles may reach the threshold for pinnipeds (e.g., Steller sea lions), it is anticipated to be very near source (<15m). There are no haulout sites close enough that sound at the site could be detected. Therefore, during impact pile driving, temporary in-air disturbance would be limited to harbor seals and sea lions swimming on the surface through the immediate action area near the construction site. At this distance, any animal swimming would already have been exposed to the in-water noise levels; therefore, in-air disturbance is generally not considered for pinnipeds swimming near the project site. Further, proposed mitigation would reduce the likelihood that take would occur at these distances (see Section 2.1.5) or cause serious injury. For these reasons, effects from in-air noise are considered discountable (i.e., no haulouts nearby), and insignificant (i.e., shutdown mechanisms in place would limit exposure to levels too low to result in measureable effects) for ESA-listed pinnipeds.

2. Tension Anchors

Tension anchors will be installed on 86 of the 121 steel piles. To anchor each pile following pile installation, a 10-inch casing will be inserted into the center of the pile and an 8-inch rock anchor drill will be lowered into the casing and used to drill into bedrock. Noise associated with drilling for anchors takes place below the 10-foot-deep bedrock socket that holds the pile in place, and the bedrock serves to attenuate noise production from drilling activity and reduce noise propagation into the water column and is not anticipated to reach or exceed the 120 dB threshold for continuous noise source (HDR 2018a). Given the small size of the anchoring drill, the installation method within a pile, and the low anticipated source level, the effects of tension anchor installation are not anticipated to reach the level at which take could occur and are considered insignificant.

3. 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. 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 states that Steller sea lions may be more susceptible to ship strike mortality or injury in harbors or in areas where animals are concentrated (e.g., near rookeries or haulouts) (NMFS 2008). Since 2000, there have been four reported ship strikes of Steller sea lions within Alaska, with three occurring near Sitka according to NMFS Alaska Region Stranding Program records. There are no known rookeries or haulouts within the action area. In addition, required mitigation measures described in Section 2.1.5 require all vessels associated with project construction to avoid the 3,000 ft (914 m) designated aquatic zones surrounding major rookeries or haulout locations east of 144°W longitude during transit.

In 2017, there were seven reported vessel strikes to humpback whales in Alaska but none to Steller sea lions (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 (Allen and Angliss 2016). These incidences account for a very small fraction of the total humpback whale population (Laist *et al.* 2001).

Vessels would have a transitory presence in any specific location. NMFS is not able to quantify existing traffic conditions across the action area to provide context for the addition of vessels during construction. However, Tenakee Inlet does not have an especially high volume of vessel traffic and there are no known collisions involving vessels and listed marine mammals in Tenakee Inlet despite decades of spatial and temporal overlap, which suggests that the probability of collision is low. In addition, all vessels will be required to observe the Alaska humpback whale approach regulations (100 yards), which will further reduce the likelihood of interactions.

There have been no reported strikes in the action area, the action area is small compared to available habitat for both species, there are a limited number of vessels associated with the proposed action, and the limited duration of operations suggest that this association in space and time of vessels and these listed marine mammals is unlikely. In addition, NMFS's guidelines for approaching marine mammals recommends that vessels not approach within 100 yards of marine mammals. All of these factors limit the risk of strike. We conclude the probability of strike occurring is extremely unlikely and therefore effects are discountable.

4. Disturbance of Seafloor

During DTH drilling, removal, and installation of piles, a temporary and localized increase in turbidity and sedimentation near the seafloor is possible in the immediate area surrounding each pile. Mud and other material accumulation in the pile will be augered out and allowed to settle close to the base of the 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 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.

Cetaceans are not expected to come close enough to the Tenakee Springs dock site to encounter increased turbidity from construction activities. Any pinnipeds would avoid the short-term, localized areas of turbidity. Therefore, the impact from increased turbidity levels would be negligible to marine mammals and would not cause a disruption of behavioral patterns that would rise to the level of harassment. Therefore, we conclude that the effects from this stressor are insignificant.

5. Introduction of Pollutants into Waters

A Spill Prevention, Control, and Countermeasure (SPCC) Plan, Hazardous Material Control Plan (HMCP), Water Quality Control Plan (WQCP), and other BMPs would be implemented during construction to prevent contaminants from entering the water column. Plans would be in place and materials available for spill prevention and cleanup activities at the marine terminal to limit potential contamination. Construction would be conducted in accordance with CWA Section 404 and 401 regulations, to minimize potential construction-related impacts on water quality. Therefore, we conclude that the effects from this stressor are insignificant.

6. Overwater Shading and Effects to Prey

Improvements to the Tenakee Springs ferry terminal would result in a net increase of approximately 7,224 square feet (671 square meters) of overwater shading. This may result in a small, localized reduction in habitat and productivity for benthic invertebrate resources in the project footprint due an increase in shading beneath the expanded and new docks. Indirect effects to prey for listed species would be insignificant due to the small area affected.

6.1.2 Stressors Likely to Adversely Affect ESA-listed Species

The following sections analyze the stressors likely to adversely affect ESA-listed species: underwater sounds from pile removal, pile installation, DTH hydro-hammering, and vessel noise. First, we present a brief explanation of the sound measurements used in the discussions of acoustic effects in this opinion.

Description of Sound Sources

Sound travels in waves, the basic components of which are frequency, wavelength, velocity, and amplitude. Frequency is the number of pressure waves that pass by a reference point per unit of time and is measured in hertz (Hz) or cycles per second. Wavelength is the distance between two peaks of a sound wave; lower frequency sounds have longer wavelengths than higher frequency sounds. Amplitude is the height of the sound pressure wave or the 'loudness' of a sound and is typically measured using the dB scale. A dB is the ratio between a measured pressure (with sound) and a reference pressure (sound at a constant pressure, established by scientific standards). It is a logarithmic unit that accounts for large variations in amplitude; therefore, relatively small changes in dB ratings correspond to large changes in sound pressure. When referring to sound pressure levels (SPLs; the sound force per unit area), sound is referenced in the context of underwater sound pressure to 1 microPascal (μPa). One pascal is the pressure resulting from a force of one newton exerted over an area of one square meter. The source level (SL) represents the sound level at a distance of 1 m from the source (referenced to 1 μPa). The received level is the sound level at the listener's position. Note that all underwater sound levels in this document are referenced to a pressure of 1 μPa and all airborne sound levels in this document are referenced to a pressure of 20 μPa.

Root mean square (rms) is the quadratic mean sound pressure over the duration of an impulse. Rms is calculated by squaring all of the sound amplitudes, averaging the squares, and then taking the square root of the average (Urick 1983). Rms accounts for both positive and negative values; squaring the pressures makes all values positive so that they may be accounted for in the summation of pressure levels (Hastings and Popper 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units than by peak pressures.

When underwater objects vibrate or activity occurs, sound-pressure waves are created. These waves alternately compress and decompress the water as the sound wave travels. Underwater sound waves radiate in all directions away from the source (similar to ripples on the surface of a pond), except in cases where the source is directional. The compressions and decompressions associated with sound waves are detected as changes in pressure by aquatic life and man-made sound receptors such as hydrophones.

Acoustic Thresholds

As discussed in Section 2, *Description of the Proposed Action*, ADOT&PF intends to conduct construction activities that would introduce acoustic disturbance.

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[2], expressed in

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[2] 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.

root mean square[3] (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 thresholds in Table 9 for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (NMFS 2016c). These acoustic thresholds are presented using dual metrics of cumulative sound exposure level (L_E) and peak sound level (PK) for impulsive sounds and L_E for non-impulsive sounds:

Table 9. PTS onset acoustic thresholds for Level A harassment (NMFS 2016c).

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 $L_{E,MF,24h}$: 185 dB	$L_{E,MF,24h}$: 198 dB
High-Frequency (HF) Cetaceans	$L_{pk,flat}$: 202 dB $L_{E,HF,24h}$: 155 dB	$L_{E,HF,24h}$: 173 dB
Phocid Pinnipeds (PW) (Underwater)	$L_{pk,flat}$: 218 dB $L_{E,PW,24h}$: 185 dB	$L_{E,PW,24h}$: 201 dB
Otariid Pinnipeds (OW) (Underwater)	$L_{pk,flat}$: 232 dB $L_{E,OW,24h}$: 203 dB	$L_{E,OW,24h}$: 219 dB

* Dual metric acoustic thresholds for impulsive sounds: Use whichever results in the largest isopleth for calculating PTS onset. If a non-impulsive sound has the potential of exceeding the peak sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered.

Note: Peak sound pressure (L_{pk}) has a reference value of 1 µPa, and cumulative sound exposure level (L_E) has a reference value of 1$\mu Pa^2 s$. 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] Root mean square (rms) is the square root of the arithmetic average of the squared instantaneous pressure values.

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

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

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 recently issued guidance interpreting the term "harass" under the ESA as a 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). For the purposes of this consultation, any action that amounts to incidental harassment under the MMPA—whether Level A or Level B— constitutes an incidental "take" under the ESA and must be authorized by the ITS (Section 10).

As described below, we anticipate that exposures to listed marine mammals from noise associated with the proposed action may result in disturbance (Level B harassment). With the addition of mitigation measures including shutdown zones, no mortalities or permanent impairment to hearing are anticipated. The Level A and Level B thresholds and associated isopleths for the project are shown in Table 10.

6.1.3 Summary of Effects

Stressors Not Likely to Adversely Affect ESA-listed Species

In conclusion, based on review of available information, we determined effects from in-air noise and disturbance, and vessel strike are extremely unlikely to occur. We consider the effects to WDPS Steller sea lions and Mexico DPS humpback whales to be discountable.

We determined tension anchor installation, disturbance of seafloor, introduction of pollutants to water, and overwater shading and effects to prey are not likely to have measurable impact; therefore, we consider effects to ESA-listed whales and pinnipeds to be insignificant.

Stressors Likely to Adversely Affect ESA-listed Species

The following stressors are likely to adversely affect ESA-listed species: underwater noise from pile removal, installation, and rock drilling, and vessel noise. These stressors will be analyzed below in the *Exposure Analysis.*

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.

6.2.1 Exposure to Noise from Pile Driving/Pile Removal/DTH Drilling

WDPS Steller sea lions and Mexico DPS humpback whales 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 vibratory, 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 because of the proposed action due to the implementation of shutdown zones (Table 4) and the marine mammal monitoring plan in Section 2.1.2 will reduce the potential for exposure to levels of underwater noise above the injury threshold established by NMFS.

Approach to Estimating Exposures to Noise from Pile Driving, Removal, and DTH Drilling

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 permanent hearing impairment; 2) the area or volume of water that will be ensonified above these levels in a day; 3) the density or occurrence of listed marine mammals within these ensonified areas; and 4) and the number of days of activities.

Distances to Level A and Level B Sound Thresholds

Vibratory and impact pile installation, vibratory pile removal, and DTH drilling would generate underwater noise that could potentially disturb ESA-listed marine mammals in the action area. Ambient underwater sound levels were assumed to be 120 dB rms for this evaluation. The Sound Source Levels (SSLs) for proposed pile installation and removal activities were estimated by using the results of measurements from the best available and most relevant sound source verification (SSV) studies (see Table 3).

Attenuation levels can be highly variable, and are dependent on numerous characteristics of the water, substrate, and noise source. The three SSV studies in southeast Alaska calculated transmission loss (TL) coefficients that ranged from 12.0 to 21.9 (Denes 2016). However, NMFS typically recommends a default practical spreading loss of 15 dB per tenfold increase in distance when empirical data are unavailable. Using a TL coefficient of 15 dB produces conservative estimates of harassment thresholds for the project (Table 9).

Level A Thresholds

Sound propagation and the distances to the sound isopleths defined by NMFS for Level A harassment of marine mammals under the current Technical Guidance were estimated using the User Spreadsheet developed by NMFS for this purpose (NMFS 2016c). Differences in hearing abilities among marine mammals are accounted for by use of weighting factor adjustments for the five functional hearing groups (NMFS 2016c). Pulse duration from the SSV studies used for source level estimates are unknown. All necessary parameters were available for the SELcum (cumulative Single Strike Equivalent) method for calculating isopleths, and therefore this method was selected. The SELcum method resulted in isopleths that were larger than those calculated using the peak source level method, and therefore the SELcum isopleths were selected for the project (Table 10). To account for potential variations in daily productivity during impact installation, isopleths were calculated for different numbers of piles that could be installed each day (Table 10). Therefore, should the contractor expect to install fewer piles in a day than the maximum anticipated, a smaller Level A shutdown zone would be adequate to avoid take.

For vibratory pile installation, Level A harassment isopleths range from 1 to 19 meters for all functional hearing groups (Table 10). For DTH drilling, Level A harassment isopleths range from 2 to 81 meters for all functional hearing groups. For impact installation, Level A harassment isopleths range from less than 1 meter to 176 meters, with the largest Level A zones calculated for high-frequency and low-frequency cetaceans (Table 10). Overall, Level A harassment zones for impact installation are relatively small because of the few strikes required to proof the piles. The maximum aquatic areas ensonified within the Level A harassment isopleths do not exceed 0.1 square kilometer (Table 10). To avoid and minimize incidental Level A exposure of marine mammals, a conservative shutdown zone of 50 meters for pinnipeds and 100 meters for cetaceans will be used during most monitoring (DTH drilling and removal/installation of less than 24-inch diameter piles). A 200-meter shutdown zone will be implemented for low-frequency and high-frequency cetaceans during impact installation of 24-inch and 30-inch piles at a rate of two or three per day (see Section 2.1.5) (HDR 2018b).

Table 10. Distances to Level A Exclusion and Level B Disturbance Zones (HDR 2018b).

Type of Pile	Distance to Level A Exclusion Zone (meters)		Level B Disturbance Zone (meters), Cetaceans and Pinnipeds
	Humpback Whale	Steller Sea Lion	
Vibratory			
30-inch steel	11	1	10,000
24-inch steel, 20-inch steel, 18-inch steel	6	1	5,412
18-inch steel, 16-inch steel	13	1	5,412
14-inch steel, 14-inch timber, 12.75-inch steel	5	1	2,154
DTH Drilling			
30-inch steel, 20-inch steel	55	3	10,000
24-inch steel, 18-inch steel	42	2	10,000
Impact			
30-inch steel	70	3	2,057
	110	5	
	144	6	
24-inch steel	71	3	1,585
	113	5	
	148	6	

Type of Pile	Distance to Level A Exclusion Zone (meters)		Level B Disturbance Zone (meters), Cetaceans and Pinnipeds
	Humpback Whale	Steller Sea Lion	
Impact			
20-inch steel	64	3	584
18-inch steel	<1	<1	7
14-inch timber	<1	<1	7

Level B Thresholds
Sound propagation and distances to the sound isopleths defined by NMFS for Level B harassment of marine mammals were estimated using the practical spreading loss model. The source levels for proposed pile installation and removal activities were estimated using the results of measurements from the best available and most relevant sound source verification studies (see Table 3).

The formula for transmission loss is TL = X log10 (R/10), where R is the distance from the source, assuming the near-source levels are measured at 10 meters and X is the TL coefficient (i.e., 15log10 in this case). This TL model, based on the default practical spreading loss assumption, was used to predict the distances to the Level B disturbance isopleths for the underwater noise levels generated by pile installation for the project (Table 4).

Exposure Estimates
There are no known density estimates, systematic counts, or surveys of WDPS Steller sea lions or Mexico DPS humpback whales in the action area. Therefore, the best information regarding abundance and distribution of these species comes from anecdotal reports from local residents, extrapolations from nearby sea lion haulouts that have been regularly monitored, and analyses of the proportion of sea lions and humpback whales in the action area that are likely to be from a listed DPS.

Western DPS Steller sea lions
Anecdotal reports from an employee of the existing ferry terminal fuel dock indicate that sea lions are generally present only in the fall and winter. Reports of these anecdotal observations also suggest that as many as 10–20 may swim by on a winter day, although most feed at night when their herring prey tend to be near the water's surface (Wheeler, K., pers. comm.).

The closest Steller sea lion haulout to the project area is the Tenakee Cannery Point haulout, which is approximately 8.9 kilometers (4.8 nautical miles) east of the project site (Fritz *et al.* 2016d)(Figure 9). Steller sea lion abundance in the project area is highly seasonal in nature with sea lions being most active between October and March (Figure 11) which is consistent with anecdotal reports of sea lion abundance in the project area (Rasanen, L., pers. comm.; Wheeler, K., pers. comm.). Pups have not been counted at this haulout (Fritz *et al.* 2016c). In addition to those counted at the haulouts, as many as a few hundred more sea lions occur throughout Tenakee Inlet in small hunting groups (Rasanen, L., pers. comm.). Recent summer counts have not recorded any Steller sea lions at this haulout, and historical counts between April and September have not exceeded 12 individuals during any survey (Fritz *et al.* 2016b). The Point Marsden and Emmons haulouts are also located within 20 nautical miles of Tenakee Springs, but it is unlikely that individuals from those haulouts regularly inhabit Tenakee Inlet. NMFS estimates that roughly 17.8 percent of the Steller sea lions at the Tenakee Cannery Point haulout are members of the WDPS (L. Fritz, pers. comm; L. Fritz, unpublished data).

Steller sea lion abundance in the project area is highly seasonal in nature with sea lions being most active between October and March (Figure 11). Level B exposure estimates are conservatively based on the average winter (October to March) abundance of 140 sea lions at the Tenakee Cannery haulout (Jemison, 2017, unpublished data). However, it is unlikely that the entire Steller sea lion population from the Tenakee Cannery haulout would forage to the west near the Tenakee Springs ferry terminal. Additionally, Steller sea lions do not generally forage every day, but tend to forage every 1–2 days and return to haulouts to rest between foraging trips (Merrick *et al.* 1997, Rehberg *et al.* 2009). Together, this information indicates that only about half of the 140 Steller sea lions (i.e., about 70 animals) at the Tenakee Cannery haulout (on average during winter) are likely to approach the project site on any given day and be exposed to sound levels that constitute behavioral harassment; not every Steller sea lion will be exposed every day.

The calculation for marine mammal exposures is estimated by:

Exposure estimate = N (number of animals) × number of days animals are expected construction activities

Approximately 17.8 percent of (or 24.92 of the 140) Steller sea lions at the Tenakee Cannery haulout are anticipated to be members of the WDPS and we anticipate that half of these individuals (12.46) would approach the project site. Therefore:

*12.46 WDPS Steller sea lions per day * 93 days of exposure = 1,159 potential exposures*

The estimated 1,159 WDPS Steller sea lion exposures to elevated sound levels represents 0.05 percent of the WDPS (currently estimated at 53,303 individuals; Table 11), although the total number of exposures may include multiple days of exposure for some of the same animals, so a smaller number of individual WDPS sea lions may be affected. Any disturbance would be temporary and is not expected to impact the long-term health of individuals, the viability of the population, or the species. Any construction activity that takes place between April and September is expected to result in significantly lower sea lion exposure rates because fewer animals would occur near the project site.

No Level A takes are anticipated for WDPS Steller sea lions. The linear distance (from the noise source) to the threshold for a Level A take for sea lions is 6 m or less (see Table 10), and shutdown mechanisms will be applied at 100 m.

Mexico DPS Humpback whales

Humpback whales are present in Tenakee Inlet year-round. Local experts indicate that as many as 12 humpback whales are present on some days from spring through fall, and at lower numbers during winter (S. Lewis and M. Dahlheim, pers. comm.). ADOT&PF conservatively estimate that half of those, or six individuals on average, could be exposed to Level B harassment during each day of construction activity; therefore:

*6 humpback whales per day * 93 days of exposure = 558 potential exposures*

As discussed in 4.3.2 approximately 6.1 percent of humpback whales in southeast Alaska are members of the Mexico DPS (Wade *et al.* 2016). Therefore, of the 558 potential exposures, approximately 34 potential exposures would affect members of the ESA-listed Mexico DPS (see Table 11). The total number of exposures may include multiple days of exposure for some of the same animals, so a smaller number of individual Mexico DPS whales may be affected.

The maximum distance at which a humpback whale may be exposed to noise levels that exceed Level A thresholds is 148 m during impact driving 24-inch piles (see Table 10). PSOs will be stationed to ensure effective monitoring and shutdown of this zone before humpback whales enter the Level A zone avoiding Level A take. No Level A takes for Mexico DPS humpback whales are anticipated (Table 11).

Table 11. Amount of proposed incidental harassment (takes) of ESA-listed species in the proposed IHA (82 FR 41229).

Species	Proposed Authorized Level A Takes	Proposed Authorized Level B Takes
Western DPS Steller sea lion (*Eumetopias jubatus*)	0	1,159
Mexico DPS Humpback whale (*Megaptera novaeangliae*)	0	34

6.2.2 Exposure to Noise

Mitigation Measures to Minimize the Likelihood of Exposure to Vessel Noise

As discussed in Section 2.1.5, the following mitigation measures are included in the proposed action to avoid or minimize exposure of marine mammals to vessel noise:

1. Vessels will not approach within 100 m of marine mammals.

2. All vessels associated with project construction will avoid the 3,000 ft (914 m) designated aquatic zones surrounding any major rookery or haulout east of 144° W longitude.

3. If a marine mammal comes within 100 meters of a moving vessel, operations shall cease and vessels shall reduce speed to the minimum level required to maintain steerage and safe working conditions.

Results of Vessel Noise Exposure

There are two phases of vessel noise and associated disturbance related to the proposed action. The first is vessel noise associated with the construction phase, and the second is vessel noise associated with operation of the Tenakee ferry terminal.

These acoustic impacts will result from moving sources, and for individual marine mammals that are exposed to noise from transiting vessels, the effects from each exposure will be temporary in duration, on the order of minutes. For species such as humpback whales that prey upon food items that are not tied to a particular location in the way that salmon are seasonally tied to stream channels and stream mouths, effects of transient and temporary noise are expected to result in low levels of exposure that the animals can likely avoid without foregoing highly valuable foraging opportunities.

Vessel noise associated with this action will be transmitted through water and constitutes a continuous noise source. NMFS anticipates that whenever noise is produced from vessel operations, it may overlap with WDPS Steller sea lions and Mexico DPS humpback whales and that some individuals are likely to be exposed to these continuous noise sources.

Broadband source levels for tugs and barges have been measured at 145 to 170 dB re: 1 µPa, and 170 to 180 dB re: 1µPa for small ships and supply vessels (Richardson *et al.* 1995). Sound from vessels within this size range would reach the 120 dB threshold distances between 86 m and 233 m (282 and 764 feet) from the source (Richardson *et al.* 1995). Listed cetaceans and pinnipeds have the potential to overlap with vessel noise associated with the proposed construction activities. We anticipate low level exposure of short-term duration to listed marine mammals from vessel noise, and do not expect significant behavioral reactions. We will discuss potential responses of listed species to vessel noise in Section 6.3.2.

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.

Loud underwater noise can result in physical effects on the marine environment that can affect marine organisms. Possible responses by ESA-listed whales and pinnipeds to the impulsive and continuous sound produced by pile installation and removal, DTH hammering, and vessel noise include:

- Physical Response
  - Threshold shifts
  - 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

This analysis also considers information on the potential effects on prey of ESA-listed species in the action area.

6.3.1 Responses to Major Noise Sources (Pile Driving/Removal and DTH Hammering)

As described in Section 6.2, WDPS Steller sea lions and Mexico DPS humpback whales are anticipated to occur in the action area and are anticipated to overlap with noise associated with pile driving/removal and DTH drilling activities. We assume that some individuals are likely to be exposed and respond to these impulsive and continuous noise sources. Between June 1, 2019 and May 31, 2020, we estimated zero Mexico DPS humpback and zero WDPS Steller sea lions may be exposed at noise levels loud enough, long enough, or at distances close enough to cause Level A harassment (see Section 6.2.1, *Exposure to Major Noise Sources*, Table 10). In addition, we expect 34 Mexico DPS humpback and 1,159 WDPS Steller sea lion[4] instances of exposure to noise levels sufficient to cause Level B harassment. All level B instances of take are anticipated to occur at received levels ≥ 120 dB or 160 dB for continuous and impulsive noise sources respectively.

The effects of sounds from pile driving/removal and DTH hammering might 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 2007, Nowacek *et al.* 2007, Southall *et al.* 2007). The effects of pile driving on marine mammals are dependent on several factors, including the size, type, and depth of the animal; the depth, intensity, and duration of the pile driving sound; the depth of the water column; the substrate of the habitat; the standoff distance between the pile and the animal; and the sound propagation properties of the environment. Impacts to marine mammals from pile driving activities are expected to result primarily from acoustic pathways. As such, the degree of effect is intrinsically related to the 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. Shallow environments are typically more structurally complex, which leads to rapid sound attenuation. In addition, substrates that are soft (e.g., sand)

[4] The proposed IHA (RIN 0648-XF830) estimated a total of 6,510 total level B takes for Steller sea lions. Out of the proposed takes, 17.8% are anticipated to occur to ESA-listed WDPS animals. Similarly, the estimated total level B takes for humpback whales was 558. Out of the proposed takes, 6.1% are anticipated to occur to ESA-listed Mexico DPS animals. The basis for this apportionment is described in Sections 4.3.1 and 4.3.2.

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 drive the pile, and possibly less forceful equipment, which would ultimately decrease the intensity of the acoustic source.

In the absence of mitigation, impacts to marine species would be expected to result from physiological and behavioral responses to both the type and strength of the acoustic signature (Viada *et al.* 2008). The type and severity of behavioral impacts are more difficult to define due to limited studies addressing the behavioral effects of impulsive sounds on marine mammals. Potential effects from impulsive sound sources can range in severity from effects such as behavioral disturbance or tactile perception to physical discomfort, slight injury of the internal organs and the auditory system, or mortality (Yelverton *et al.* 1973).

Marine mammals exposed to high intensity sound repeatedly or for prolonged periods can experience hearing threshold shift (TS), which is the loss of hearing sensitivity at certain frequency ranges (Kastak *et al.* 1999, Schlundt *et al.* 2000, Finneran *et al.* 2002, Finneran *et al.* 2005). TS can be permanent (PTS), in which case the loss of hearing sensitivity is not recoverable, or temporary (TTS), in which case the animal's hearing threshold would recover over time (Southall *et al.* 2007). Marine mammals depend on acoustic cues for vital biological functions, (e.g., orientation, communication, finding prey, avoiding predators); thus, TTS may result in reduced fitness, survival, and reproduction. However, this depends on the frequency and duration of TTS, as well as the biological context in which it occurs. TTS of limited duration, occurring in a frequency range that does not coincide with that used for recognition of important acoustic cues, would have little to no effect on an animal's fitness. Repeated sound exposure that leads to TTS could cause PTS. PTS constitutes injury, but TTS does not (Southall *et al.* 2007). The following subsections discuss in somewhat more detail the possibilities of TTS, PTS, and non-auditory physical effects. We anticipate that few (if any) exposures would occur at received levels >160 dB due to avoidance of high received levels, and shut-down mitigation measures.

Temporary Threshold Shift

TTS is the mildest form of hearing impairment that can occur during exposure to a strong sound (Kryter 1985). While experiencing TTS, the hearing threshold rises, and a sound must be stronger in order to be heard. In terrestrial mammals, TTS can last from minutes or hours to days (in cases of strong TTS). For sound exposures at or somewhat above the TTS threshold, hearing sensitivity in both terrestrial and marine mammals recovers rapidly after exposure to the sound ends. Few data on sound levels and durations necessary to elicit mild TTS have been obtained for marine mammals, and none of the published data concern TTS elicited by exposure to multiple pulses of sound. Available data on TTS in marine mammals are summarized in (Southall *et al.* 2007).

For low-frequency cetaceans, no behavioral or auditory evoked potential (AEP) threshold data exist. Therefore, hearing thresholds were estimated by synthesizing information from anatomical measurements, mathematical models of hearing, and animal vocalization frequencies (NMFS 2016c).

California sea lions experienced TTS-onset from underwater non-pulsed sound at 174 dB re 1 µ Pa (Kastak *et al.* 2005), but also did not show TTS-onset from pulsed sound at 183 dB re 1 µ Pa (Finneran *et al.* 2003). It is not clear exactly when Steller sea lions may experience TTS and PTS.

Few (if any) exposures would occur at received levels >160 dB resulting in TTS due to avoidance of high received levels, and shut-down mitigation measures.

Permanent Threshold Shift

When PTS occurs, there is physical damage to the sound receptors in the ear. In severe cases, there can be total or partial deafness, while in other cases the animal has an impaired ability to hear sounds in specific frequency ranges (Kryter 1985). There is no specific evidence that exposure to pulses of sound can cause PTS in any marine mammal. However, given the possibility that mammals close to a sound source can incur TTS, it is possible that some individuals will incur PTS. Single or occasional occurrences of mild TTS are not indicative of permanent auditory damage, but repeated or (in some cases) single exposures to a level well above that causing TTS onset might elicit PTS.

Relationships between TTS and PTS thresholds have not been studied in marine mammals but are assumed to be similar to those in humans and other terrestrial mammals, based on anatomical similarities. PTS might occur at a received sound level at least several decibels above that inducing mild TTS if the animal were exposed to strong sound pulses with rapid rise time. For non-impulsive exposures (i.e., vibratory pile driving), a variety of terrestrial and marine mammal data sources indicate that threshold shift up to 40 to 50 dB may be induced without PTS, and that 40 dB is a conservative upper limit for threshold shift to prevent PTS. An exposure causing 40 dB of TTS is therefore considered equivalent to PTS onset (NMFS 2016c).

No exposures are anticipated at levels resulting in PTS due to avoidance of high received levels, and shut-down mitigation measures.

Non-Auditory Physiological Effects

Non-auditory physiological effects or injuries that theoretically might occur in marine mammals exposed to strong underwater sound include stress, neurological effects, bubble formation, resonance effects, and other types of organ or tissue damage (Cox *et al.* 2006, Southall *et al.* 2007). Studies examining such effects are limited. In general, little is known about the potential for pile driving to cause auditory impairment or other physical effects in marine mammals. Available data suggest that such effects, if they occur at all, would presumably be limited to short distances from the sound source and to activities that extend over a prolonged period. The available data do not allow identification of a specific exposure level above which non-auditory effects can be expected (Southall *et al.* 2007) or any meaningful quantitative predictions of the numbers (if any) of marine mammals that might be affected in those ways. Marine mammals that show behavioral avoidance of pile driving, including some odontocetes and some pinnipeds, are especially unlikely to incur auditory impairment or non-auditory physical effects.

6.3.2 Disturbance Reactions

Disturbance includes a variety of effects, including subtle changes in behavior, more conspicuous changes in activities, and displacement. Behavioral responses to sound are highly variable and context-specific, and reactions, if any, depend on species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day, and many other factors (Southall *et al.* 2007).

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. 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. Behavioral state may affect the type of response as well. 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 showed pronounced behavioral reactions, including avoidance of loud sound sources (Ridgway *et al.* 1997, Finneran *et al.* 2003). Observed responses of wild marine mammals to loud pulsed sound sources (typically seismic guns or acoustic harassment devices, but also including pile driving) have been varied but often consist of avoidance behavior or other behavioral changes suggesting discomfort (Morton and Symonds 2002, Wartzok *et al.* 2003, Thorson and Reyff 2006, Nowacek *et al.* 2007). Responses to continuous sound, such as vibratory pile installation, have not been documented as well as responses to pulsed sounds.

With both types of pile driving, it is likely that the onset of pile driving could result in temporary, short-term changes in an animal’s typical behavior and/or avoidance of the affected area. These behavioral changes may include : changing durations of surfacing and dives, number of blows per surfacing, or moving direction and/or speed; reduced/increased vocal activities; changing/cessation of certain behavioral activities (such as socializing or feeding); visible startle response or aggressive behavior (such as tail/fluke slapping or jaw clapping); avoidance of areas where sound sources are located; and/or flight responses (e.g., pinnipeds flushing into water from haulouts or rookeries). Pinnipeds may increase their haulout time, possibly to avoid in-water disturbance (Thorson and Reyff 2006).

The biological significance of many of these behavioral disturbances is difficult to predict, especially if the detected disturbances appear minor. However, the consequences of behavioral modification could be expected to be biologically significant if the change affects growth, survival, or reproduction. Significant behavioral modifications that could potentially lead to effects on growth, survival, or reproduction include:

- Drastic changes in diving/surfacing patterns (such as those thought to cause beaked whale stranding due to exposure to military mid-frequency tactical sonar);
- Habitat abandonment due to loss of desirable acoustic environment; and

- Cessation of feeding or social interaction.

The onset of behavioral disturbance from anthropogenic sound depends on both external factors (characteristics of sound sources and their paths) and the specific characteristics of the receiving animals (hearing, motivation, experience, demography) and is difficult to predict (Southall *et al.* 2007).

6.3.3 Auditory Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with, a marine mammal's ability to hear other sounds. Masking occurs when the receipt of a sound is interfered with by another coincident sound at similar frequencies and at similar or higher levels. Chronic exposure to excessive, though not high-intensity, sound could cause masking at particular frequencies for marine mammals that utilize sound for vital biological functions. Masking can interfere with detection of acoustic signals such as communication calls, echolocation sounds, and environmental sounds important to marine mammals. Therefore, under certain circumstances, marine mammals whose acoustical sensors or environment are being severely masked could also be impaired from maximizing their performance fitness in survival and reproduction. If the coincident (masking) sound were anthropogenic, it could be potentially harassing if it disrupted hearing-related behavior. It is important to distinguish TTS and PTS, which persist after the sound exposure, from masking, which occurs only 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.

Masking occurs at the frequency band the animals utilize, so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Lower frequency man-made sounds are more likely to affect detection of communication calls and other potentially important natural sounds such as surf and prey sound. It may also affect communication signals when they occur near the sound band and thus reduce the communication space of animals (Clark *et al.* 2009b) and cause increased stress levels (Foote *et al.* 2004, Holt *et al.* 2009).

Masking has the potential to affect species at the population or community levels as well as at individual levels. Masking affects both senders and receivers of the signals and can potentially have long-term chronic effects on marine mammal species and populations. Recent research suggests that 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, and that most of these increases are from distant shipping (Hildebrand 2009). All anthropogenic sound sources, such as those from vessel traffic, pile driving, and dredging activities, contribute to the elevated ambient sound levels, thus intensifying masking.

Noise from pile driving and removal and DTH drilling is relatively short-term. It is possible that pile driving/removal noise resulting from this proposed action may mask acoustic signals important to WDPS Steller sea lions and Mexico DPS humpback whales, but the short-term duration (up to 332 total hours of impact and vibratory pile driving spread over 74 days) and limited affected area would result in insignificant 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 vibratory pile driving, and which have already been taken into account in the exposure analysis.

6.3.4 Probable Responses to Noise from Major Noise Sources

Pile driving/removal and DTH hammering activities associated with the Tenakee Springs Ferry Terminal, as outlined previously, have the potential to disturb or displace marine mammals. The specified activities may result in take, in the form of Level B harassment (behavioral disturbance), from underwater sounds generated from pile driving. Potential takes could occur if individuals of these species are present in the ensonified zone during these activities.

NMFS does not anticipate any Level A take due to appropriate monitoring and shutdown zones. NMFS does not anticipate injury or mortality given the nature of the activity and measures designed to minimize the possibility of injury to WDPS Steller sea lions or Mexico DPS humpback whales. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures.

Initial installation of steel piles through the sediment layer may be done using vibratory methods for up to 15 minutes per pile. If the sediment layer is very thin, instead of vibratory methods, a few strikes from an impact hammer may be used to seat some steel piles into the weathered bedrock before drilling begins. It is possible that only an impact hammer and drilling will be used for some piles, and only a vibratory hammer and drilling will be used for other piles, depending on sediment conditions. Impact pile driving produces short, sharp pulses with higher peak levels and much sharper rise time to reach those peaks. When impact driving is necessary, required measures (implementation of shutdown zones) reduce the potential for injury. Given sufficient “notice” through use of soft start (for impact driving), marine mammals are expected to move away from a sound source that is annoying prior to the noise becoming potentially injurious. The high likelihood of marine mammal detection by trained observers under the required observation protocols further enables the implementation of shutdowns to avoid injury, serious injury, or mortality.

The applicant’s proposed activities are spatially and temporally localized. The project will require the removal of approximately 86 piles of varying sizes and materials. Not all existing piles will be removed. It is anticipated that, when possible, existing piles will be extracted by directly lifting them with a crane. A vibratory hammer will be used only if necessary to extract piles that cannot be directly lifted. Removal of each old pile is estimated to require not more than 15 minutes of vibratory hammer use. The project will require the installation of 121 piles of varying sizes and materials. Tension anchors will be installed in 86 of the 121 total piles. All steel piles will be inserted through the overlying sediment with a vibratory hammer for no more than 15 minutes per pile. Following initial pile installation, the mud accumulation on the inside of the pile will be augered out (or cleaned through another method) as necessary. Next, a hole (rock socket) will be drilled in the underlying bedrock by using a down-hole hammer. Drill cuttings are expelled from the top of the pile as dust or mud and allowed to settle at the base of the pile. It is estimated that drilling piles through the layered bedrock will take about two to three hours per pile. Then, if necessary, about 30 blows of an impact hammer will be used to confirm that piles are set into bedrock (proofed). Proofing will require approximately 5 to 10 minutes per pile. It is possible that only an impact hammer and drilling will be used for some piles, depending on sediment conditions and as decided by the construction contractor. Installation of timber piles will use only an impact hammer, and will require approximately 75 strikes per pile, or approximately 20–30 minutes to install each pile. Pile installation activities will occur in waters from 0 to 36 feet (0 to 11 meters) deep within or immediately adjacent to the existing dock footprint.

In summary, up to 1,159 individual WDPS Steller sea lions and 34 individual Mexico DPS humpback whales may be exposed to Level B harassment sound levels during the proposed action. While mitigation measures include shut-down zones to prevent Level A exposure, if animals approach within the corresponding thresholds shown in Table 4, Level B harassment may occur. At these distances (2-10 km), a marine mammal that perceived pile driving/removal and DTH operations is likely to ignore such a signal and devote its attentional resources to stimuli in its local environment. If animals do respond, some listed species are likely to change their behavioral state – reduce the amount of time they spend at the ocean's surface, increase their swimming speed, change their swimming direction to avoid pile driving, change their respiration rates, increase dive times, reduce feeding behavior, and/or alter vocalizations and social interactions (Frid and Dill. 2002, Koski *et al.* 2009, Funk *et al.* 2010, Melcon *et al.* 2012).

Prey

As described in the *Status of Listed Species*, in Southeast Alaska, marine mammal distributions and seasonal increases in their abundance are strongly influenced by seasonal pre-spawning and spawning aggregations of forage fish, particularly Pacific herring (*Clupea pallasii*), eulachon (*Thaleichthys pacificus*) and Pacific salmon (*Onchorynchus spp.*) (Marston *et al.* 2002, Sigler *et al.* 2004, Womble *et al.* 2005). All five species of salmon are found in Southeast Alaska and are preyed upon by Steller sea lions.

Herring are the keystone species in Southeast Alaska, especially in Tenakee Inlet, serving as a vital link between lower trophic levels, including crustaceans and small fish, and higher trophic levels. Foraging studies of Steller sea lions suggest that during their non-breeding season, they forage on seasonally densely aggregated prey (Sinclair and Zeppelin 2002). In Southeast Alaska, Pacific herring typically spawn from March to May and attract large numbers of predators (Marston *et al.* 2002, Womble *et al.* 2009). The relationship between humpback whales and Steller sea lions and these ephemeral fish runs is so strong in Southeast Alaska that the seasonal abundance and distribution of marine mammals reflects the distribution of pre-spawning and spawning herring, and overwintering aggregations of adult herring.

Of all known Steller sea lion prey species, only Chinook and Coho salmon have been studied for effects of exposure to pile driving noise (Halvorsen *et al.* 2012). These studies defined very high noise level exposures (SEL_{cum} of 210 dB re 1$\mu Pa^2 \cdot s$) as threshold for onset of injury, and supported the hypothesis that one or two mild injuries resulting from pile driving exposure at these or higher levels are unlikely to affect the survival of the exposed animals, at least in a laboratory environment. Hart Crowser Inc. *et al.* (2009) studied the effects on juvenile Coho salmon from pile driving of sheet piles at the Port of Anchorage in Knik Arm of Cook Inlet. The fish were exposed in-situ (in that location) to noise from vibratory or impact pile driving at distances ranging from less than 1 meter to over 30 meters. The results of this studied showed no mortality of any of the test fish within 48 hours of exposure to the pile driving activities, and for the necropsied fish, no effects or injuries were observed as a result of the noise exposure (NMFS 2016b).

Noise generated from pile driving/removal and DTH can reduce the fitness and survival of fish in areas used by foraging marine mammals; however, given the small area of the project site relative to known feeding areas in Southeast Alaska, and the fact that any physical changes to this habitat would not be likely to reduce the localized availability of fish (Fay and Popper 2012), it is unlikely that marine mammals would be affected. In general, we expect fish will be capable of moving away from project activities if they experience discomfort. We expect the area in which stress, injury, TTS, or changes in balance, of prey species may occur (if at all) will be limited to a few meters directly around the pile driving and DTH hammering operations. We consider potential adverse impacts to prey resources from pile-driving and DTH hammering in the action area to be unlikely.

Studies on euphausiids and copepods, which are some of the more abundant and biologically important groups of zookplankton, have documented the use of hearing receptors to maintain schooling structures (Wiese 1996) and detection of predators (Chu *et al.* 1996) respectively, and therefore have some sensitivity to sound; however any effects of pile driving/removal and DTH hammering on zooplankton would be expected to be restricted to the area within a few feet or meters of the project and would likely be sub-lethal.

No appreciable adverse impact on zooplankton populations will occur due in part to large reproductive capacities and naturally high levels of predation and mortality of these populations. Any mortality or impacts on zooplankton as a result of construction operations is immaterial as compared to the naturally-occurring reproductive and mortality rates of these species. This is consistent with previous conclusions that crustaceans (such as zooplankton) are not particularly sensitive to sound produced by even louder impulsive sounds such as seismic operations (Wiese 1996).

6.3.5 Responses to Vessel Traffic and Noise

As described in Section 6.2.2, Mexico DPS 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.

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

Disturbance of Steller sea lion haulouts and rookeries can potentially cause disruption of reproduction, stampeding, or increased exposure to predation by marine predators. Close approach by humans, boats, or aircraft caused hauled out sea lions to go into the water, and caused some animals to move to other haulouts during a study in Southeast Alaska (Kucey 2005). There are no haulouts or rookeries in the action area and the closest haulout, the Tenakee Cannery, is 8.9 km (4.8 nm) away (Figure 9). Vessels that approach rookeries and haulouts at slow speed and in a manner that sea lions can observe the approach, have less effect than fast approaches and a sudden appearance. Sea lions may become accustomed to repeated slow vessel approaches, resulting in minimal response. Although low levels of occasional disturbance may have little long-term effect, areas subjected to repeated disturbance may be permanently abandoned (Kenyon 1962).

As we discussed previously, based on the suite of studies of cetacean behavior to vessel approaches (Au and Perryman 1982, Hewitt 1985, Bauer and Herman 1986, Corkeron 1995, Bejder et al. 1999, Au and Green 2000, Nowacek et al. 2001, David 2002b, Magalhaes et al. 2002, Ng and Leung 2003, Goodwin and Cotton 2004, Bain et al. 2006, Bejder et al. 2006, Lusseau 2006, Richter et al. 2006, Lusseau and Bejder 2007, Schaffar et al. 2013), the set of variables that help determine whether marine mammals are likely to be disturbed by surface vessels include:

1. *Number of vessels*. The behavioral repertoire marine mammals have used to avoid interactions with surface vessels appears to depend on the number of vessels in their perceptual field (the area within which animals detect acoustic, visual, or other cues) and the animal's assessment of the risks associated with those vessels (the primary index of risk is probably vessel proximity relative to the animal's flight initiation distance).
2. *Below a threshold number of vessels* (which probably varies from one species to another, although groups of marine mammals probably share sets of patterns): studies have shown that whales will attempt to avoid an interaction using horizontal avoidance behavior. Above that threshold, studies have shown that marine mammals will tend to avoid interactions using vertical avoidance behavior, although some marine mammals will combine horizontal avoidance behavior with vertical avoidance behavior (Lusseau 2003, Christiansen *et al.* 2010).
3. *Distance between vessel and marine mammals* when the animal perceives that an approach has started and during the course of the interaction (Au and Perryman 1982, Kruse 1991, David 2002a).
4. *Vessel's speed and vector* (David 2002a).
5. *Predictability of the vessel's path*. That is, cetaceans are more likely to respond to approaching vessels when vessels stay on a single or predictable path (Williams *et al.* 2002, Lusseau 2003) than when it engages in frequent course changes (Evans et al. 1994, Williams et al. 2002, Lusseau 2006).
6. *Noise associated with the vessel* (particularly engine noise) and the rate at which the engine noise increases, which the animal may treat as evidence of the vessel's speed (David 2002a, Lusseau 2003, Lusseau 2006).

7. *Type of vessel* (displacement versus planning), which marine mammals may be interpret as evidence of a vessel's maneuverability (Goodwin and Cotton 2004).
8. *Behavioral state of the marine mammals* (David 2002a, Lusseau 2003, Lusseau 2006). For example, Würsig *et al.* (1998) concluded that whales were more likely to engage in avoidance responses when the whales were 'milling' or 'resting' than during other behavioral states.

Most of the investigations cited earlier reported that animals tended to reduce their visibility at the water's surface and move horizontally away from the source of disturbance or adopt erratic swimming strategies (Williams *et al.* 2002, Lusseau 2003, Lusseau 2006). In the process, their dive times increased, vocalizations and jumping were reduced (with the exception of beaked whales), individuals in groups move closer together, swimming speeds increased, and their direction of travel took them away from the source of disturbance (Kruse 1991, Evans et al. 1994). Some individuals also dove and remained motionless, waiting until the vessel moved past their location. Most animals finding themselves in confined spaces, such as shallow bays, during vessel approaches tended to move towards more open, deeper waters (Kruse 1991). We assume that this movement would give them greater opportunities to avoid or evade vessels as conditions warranted.

Humpback whale reactions to approaching boats are variable, ranging from approach to avoidance (Payne 1978, Salden 1993). Baker *et al.* (1983) reported that humpbacks in Hawaii responded to vessels at distances of 2 to 4 km. Bauer and Herman (1986) concluded that reactions to vessels are probably stressful to humpback whales, but that the biological significance of that stress is unknown. Humpback whales seem less likely to react to vessels when actively feeding than when resting or engaged in other activities (Krieger and Wing 1984). Mothers with newborn calves seem most sensitive to vessel disturbance (Clapham and Mattila 1993). Marine mammals that have been disturbed by anthropogenic noise and vessel approaches are commonly reported to shift from resting behavioral states to active behavioral states, which would imply that they incur an energy cost. Morete *et al.* (2007) reported that undisturbed humpback whale cows that were accompanied by their calves were frequently observed resting while their calves circled them (milling) and rolling interspersed with dives. When vessels approached, the amount of time cows and calves spent resting and milling respectively declined significantly.

Animals that perceive an approaching potential predator, predatory stimulus, or disturbance stimulus have four behavioral options (*see* (Nonacs and Dill 1990, Blumstein 2003):

a. ignore the disturbance stimulus entirely and continue behaving as if a risk of predation did not exist;
b. alter their behavior in ways that minimize their perceived risk of predation, which generally involves fleeing immediately;
c. change their behavior proportional to increases in their perceived risk of predation, which requires them to monitor the behavior of the predator or predatory stimulus while they continue their current activity; or

d. take proportionally greater risks of predation in situations in which they perceive a high gain and proportionally lower risks where gain is lower, which also requires them to monitor the behavior of the predator or disturbance stimulus while they continue their current activity.

The latter two options are energetically costly and reduce benefits associated with the animal's current behavioral state. As a result, animals that detect a predator or predatory stimulus at a greater distance are more likely to flee at a greater distance (Lord *et al.* 2001). Some investigators have argued that short-term avoidance reactions can lead to longer term impacts, such as causing marine mammals to avoid an area (Salden 1988) or altering a population's behavioral budget—time and energy spent foraging versus travelling (Lusseau 2004). These impacts can have biologically significant consequences on the energy budget and reproductive output of individuals and their populations. However, these levels of responses are not anticipated in association with the proposed action as described below.

6.3.6 Probable Responses to Vessel Traffic

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 equipment. Vessel speed, course changes, and sounds associated with their engines may be considered stressors to marine mammals.

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 slight 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 Mexico DPS humpback whales and WDPS Steller sea lions is not anticipated to cause significant disruption of either species' behaviors.

6.4 Interrelated/Interdependent Effects

NMFS did not identify any interrelated or interdependent effects associated with this project.

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.

Some continuing non-Federal activities are reasonably certain to contribute to climate change within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 5.0).

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). We expect climate change, fisheries, harvest, noise, pollutants and discharges, scientific research, and ship strike will continue into the future. We expect the moratoria on commercial whaling and bans on commercial sealing will remain in place, aiding in the recovery of ESA-listed whales and pinnipeds.

The action area will likely continue to function as a localized water-based transit station for AMHS ferry traffic and tug and barge operations. Restrictions in capacity at the Tenakee Springs ferry dock, low demand, and low expected population growth in the area will likely limit substantial growth. Tourism and community development activities will continue to occur in southeast Alaska, but at a level comparable to present. The current and recent population trends for both WDPS Steller sea lions and Mexico DPS humpback whales indicate that these levels of activity are not hindering population growth.

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.

The survival and recovery of WDPS Steller sea lion and Mexico DPS humpback whales in the action area may be affected by:

- Climate change
    - Prey distribution
    - Habitat quality
- Fisheries interactions
- Subsistence harvests
- Natural and anthropogenic noise
- Pollutants and discharges
- Scientific research
- Ship strike

Despite these pressures, available trend information indicates the abundance of WDPS Steller sea lions is increasing overall and increasing in the eastern Gulf of Alaska where the proposed action is located, although it is decreasing in the western portion of the DPS's range. Population trends for Mexico DPS humpbacks are not known, however, Hawaii DPS humpback which are also in the action area are growing at a rate of nearly 6 percent (Muto *et al.* 2017).

We concluded in the *Effects of the Action* (Section 6 of this opinion) that ESA-listed whales and pinnipeds may be harassed by the proposed activities. We expect the following number of whales and sea lions to represent the maximum number of individuals that will be exposed to Level A and Level B harassment associated with the proposed action:

- 0 (Level A) and 1,159 (Level B) takes of Western DPS Steller sea lions
- 0 (Level A) and 34 (Level B) takes of Mexico DPS humpback whales

WDPS Steller Sea Lion Risk Analysis

Based on the results of the *Exposure Analysis* for the proposed activities, we expect a maximum of 6,510 Steller sea lions may be behaviorally harassed by noise from pile driving/removal and DTH hammering, and we assume that 17.8% (1,159) of those instances of harassment would affect individuals from the WDPS (see Table 11).

The Steller sea lion recovery plan (NMFS 2008) lists recovery criteria that must 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 anticipated level of harassment, no anticipated injury or mortality, and no significant effects to habitat.

Exposure to airborne noise (pile driving, removal, and DTH drilling), vessel noise from transit, and potential for vessel strike may occur, but adverse effects from vessel disturbance and noise are likely to be insignificant 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. Adverse effects from vessel strike are considered discountable because of the few additional vessels introduced by the action and the unlikelihood of these type of interactions. Because plans would be in place and materials would be available for spill prevention and cleanup, we conclude that the effects from potential contaminants are insignificant.

WDPS Steller sea lions' probable response to pile driving, removal, and DTH drilling activities 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). 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 2.17 percent per year. Even if exposure to some WDPS Steller sea lions were to occur from pile driving and removal operations, the individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of WDPS Steller sea lions. NMFS does not anticipate any effects from this action on the reproductive success of WDPS 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 pile driving/removal or DTH noise 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.

Coastal development can affect WDPS Steller sea lions, especially where new facilities are built in harbors with fish processing facilities, as sea lions tend to be frequently or continuously present near these sites. Such effects are likely not hindering recovery, however. 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 may remain so. Subsistence hunting occurs at fairly low levels for this DPS. Illegal shooting is also a continuing threat, but it probably does not occur at levels that are preventing recovery. Ship strikes pose a low level 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 range in 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, this project is not likely to appreciably reduce WDPS Steller sea lions' likelihood of surviving or recovering in the wild.

Mexico DPS Humpback Whale Risk Analysis

Based on the results of the *Exposure Analysis,* we expect a maximum of 558 humpback whales may be exposed to noise from pile driving, and 6.1% (34) of those instances of harassment would affect individuals from the threatened Mexico DPS. Humpback whales are not expected to be exposed to airborne noise. Exposure to vessel noise from transit and potential for vessel strike may occur, but adverse effects from vessel disturbance and noise are likely to be insignificant 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. Adverse effects from vessel strike are considered discountable because of the few additional vessels introduced by the action and unlikelihood of these type of interactions. Because plans would be in place and materials would be available for spill prevention and cleanup, we conclude that the effects from potential contaminants are insignificant.

Humpback whales' probable response to pile driving and pile removal 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 we have discussed are not likely to reduce the energy budgets of humpback whales, and their probable exposure to noise sources are 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. Mexico DPS humpback whales feed in Southeast Alaska in the summer months, but migrate to Mexican waters for breeding and calving in winter months. As a result, the probable responses to pile driving and removal noise 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.

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. Additionally, even when considered in conjunction with the effects of the proposed action, 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 current and recent population trends for humpback whales in Southeast Alaska indicate that these levels of activity are not hindering population growth.

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

9. CONCLUSION

This Biological Opinion has considered the direct, indirect, and cumulative effects of this action on WDPS Steller sea lions and Mexico DPS humpback whales. The proposed action is expected to result in direct and indirect impacts to these species. We estimate Level B take of up to 1,159 WDPS Steller sea lions and 34 Mexico DPS humpback whales may occur during the term of the IHA (i.e. construction period) by harassment, although the total number of exposures may include multiple days of exposure for some of the same animals, so a smaller number of individual WDPS sea lions and Mexico DPS humpback whales may be affected. This harassment is not likely to result in injury or death, although individuals may alter their behavior for a brief period of time.

After reviewing the current status of the ESA-listed species, the environmental baseline within the action area, the anticipated effects of the proposed action, and the possible cumulative effects, it is NMFS's biological opinion that the FHWA's proposed action, and PR1's proposed issuance of an IHA to ADOT&PF, are not likely to jeopardize the continued existence of WDPS Steller sea lions or Mexico DPS humpback whales. In addition, the proposed action is not likely to adversely affect sperm whales or Steller sea lion critical habitat.

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 recent 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, FHWA and PR1 anticipate that any take will be by harassment only. No Level A takes are contemplated or authorized.

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**. Absent such authorization, this incidental take statement is inoperative.

The terms and conditions described below are nondiscretionary. FHWA and PR1 have a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, FWHA and PR1 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 FHWA 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) fails 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).

NMFS anticipates the proposed Tenakee Spring Ferry Terminal maintenance project, between June 1, 2019 and May 31, 2020, is likely to result in the incidental take of ESA-listed species by Level B harassment. As discussed in Section 6.2 of this opinion, the proposed action is expected to result in the number of takes of ESA-listed species described in Table 12.

Table 12. Summary of anticipated instances of exposure to sound from pile driving/removal and DTH hammering resulting in the incidental take of WDPS Steller sea lions and Mexico DPS humpback whales by behavioral harassment.

Species*	Total amount of take associated with proposed action		Anticipated temporal extent of take
	Level A	Level B	
Western DPS Steller sea lion	0	1,159	June 1, 2019 through May 31, 2020
Mexico DPS humpback whale	0	34	
* These take numbers reflect only the individuals from these species that are expected to be from the ESA-listed DPSs.			

Level B harassment of these individuals will occur by exposure to received sound from continuous sound sources with received sound levels of least 120 dB re 1 μPa_{rms} (i.e., vibratory or DTH hammering), or exposure to received sound from impulsive sound sources with received sound levels of least 160 dB re 1 μPa_{rms} (i.e., impact hammering). The take estimate is based on the best available information of whale and pinniped surveys and sightings in the area that will be ensonified from the proposed activities. Death or injury is not expected for any individual whales or pinnipeds that are exposed to these sounds.

ESA-listed whales and pinnipeds observed within the level B threshold during pile removal/installation or DTH hammering will be considered to be taken, even if they exhibit no overt behavioral reactions due to the potential for unobservable physiological responses.

Any incidental take of ESA-listed whales and pinnipeds considered in this consultation is restricted to the permitted action as proposed. If the actual incidental take exceeds the predicted level or type, the FHWA and PR1 must reinitiate consultation. Likewise, if the action deviates from what is described in Section 2 of this opinion, the FHWA and PR1 must reinitiate consultation.

10.2 Effect of the Take

Studies of marine mammals and responses to anthropogenic impacts have shown that Steller sea lions and humpback whales are likely to respond behaviorally upon hearing high levels of acoustic disturbance. The only takes authorized during the proposed action are takes by acoustic harassment. No serious injury or mortalities are anticipated or authorized as part of this proposed action. Although the biological significance of those behavioral responses remains unknown, 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 the conclusions section 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 WDPS Steller sea lions or Mexico DPS humpback whales.

10.3 Reasonable and Prudent Measures (RPMs)

“Reasonable and prudent measures” are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02).

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 WDPS Steller sea lions and Mexico DPS humpback whales resulting from the proposed action.

1. 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.
2. The taking of WDPS Steller sea lions and Mexico DPS humpback whales shall be by incidental harassment only. The taking by serious injury or death is prohibited and may

result in the modification, suspension, or revocation of the ITS.

3 FHWA and PR1 shall implement a monitoring program that allows NMFS AKR to evaluate the exposure estimates contained in this opinion and that underlie this incidental take statement.

4 FHWA and PR1 shall submit reports to NMFS AKR that evaluate the mitigation measures and the results of the monitoring program.

10.4 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 FHWA 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 2.1.5*] of this opinion. FHWA 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, FHWA, NMFS PR1, or their authorization holder must undertake the following:

A. FHWA and NMFS PR1 shall require their permitted operators to possess a current and valid Incidental Harassment Authorization issued by NMFS under section 101(a)(5) of the MMPA, and any take must occur in compliance with all terms, conditions, and requirements included in such authorizations.

B. Conduct the action as described in this document including all mitigation measures and observation and shut-down zones.

To carry out RPM #2, FHWA, NMFS PR1, or their authorization holder must undertake the following:

A. The taking of any marine mammal in a manner other than that described in this ITS must be reported immediately to NMFS AKR, Protected Resources Division at 907-586-7638.

B. 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, Kim.Raum-Suryan@noaa.gov, the NMFS Alaska Regional Stranding Coordinator at 907-271-1332 or Mandy.Migura@noaa.gov, and NMFS Permits, Conservation and Education Division at 301-427-8440 or Jonathan.Molineaux@noaa.gov.

To carry out RPM #3, FHWA, NMFS PR1, or their authorization holder must undertake the following:

A. The shutdown zones 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.

To carry out RPM #4, FHWA, NMFS PR1, or their authorization holder must undertake the following:

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. Submit monthly PSO reports, a final PSO report, and completed marine mammal observation record forms (developed by applicant) during the project to the Protected Resources Division, NMFS by email to Kim.Raum-Suryan@noaa.gov. Details to include in the reports include:

   - The reporting period for each monthly PSO report will be the entire calendar month, and reports will be submitted by close of business on the 5th business day of the month following the end of the reporting period (e.g., The monthly report covering May 1 through 31, 2019, will be submitted to NMFS Alaska Region by close of business [i.e., 5:00 pm, AKDT] on June 7, 2019).
   - Completed marine mammal observation record forms, in electronic format, will be provided to NMFS Alaska Region in monthly reports.
   - PSO report data will include the following for each listed marine mammal observation (or "sighting event" if repeated sightings are made of the same animal[s]):

      i. Species, date, and time for each sighting event; number of animals per sighting event and number of adults/juveniles/calves/pups per sighting event;

      ii. Primary, and, if observed, secondary behaviors of the marine mammals in each sighting event;

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

      iv. Time and description of most recent project activity prior to marine mammal observation; and

      v. Environmental conditions as they existed during each sighting event, including, but not limited to: Beaufort Sea State, weather conditions, visibility (km/mi), lighting conditions.

   - PSO monthly report data will also include the following for each take of a marine mammal that occurs in the manner and extent as described in Section 10 of this opinion:

i. Cause of the take (e.g., humpback within Level B zone during impact pile driving);

ii. Time the animal(s) entered the zone, and, if known, the time it exited the zone; and

iii. For takes of humpback whales and Steller sea lion, the PSO report will estimate the probability of occurrence of ESA-listed DPSs out of the total estimated takes (e.g., Out of a total 350 Steller sea lions estimated to be taken by Level B harassment, WDPS 0.5 (350) = 175 sea lions may have been taken).

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 Kim.Raum-Suryan@noaa.gov. This report must contain the following information:

- Dates, times, species, number, location, and behavior of any observed ESA-listed marine mammals, including all observed Steller sea lions and/or humpback whales.
- For takes of humpback whales and Steller sea lion, the PSO report will estimate the probability of occurrence of ESA-listed DPSs out of the total estimated takes (e.g., Out of a total 500 Steller sea lions estimated to be taken by Level B harassment, WDPS 0.178 (500) = 89 WDPS sea lions may have been taken been taken).
    - Note that only 17.8% of Steller sea lions and 6.1% of humpback whales are expected to be from the ESA listed DPSs and will count towards the Steller sea lions and/or humpback whales listed in the Incidental Take Statement associated with this opinion.
- An estimate of the number (by species) of: (i) pinnipeds (Steller sea lions) that have been exposed to the vibratory and impact pile driving and pile removal and DTH operations (extrapolated from visual observation) at received levels greater than or equal to 120dB or 160 dB re 1 µPa (rms) (respectively) with a discussion of any specific behaviors those individuals exhibited; and (ii) cetaceans (humpback whales) that have been exposed to the vibratory and impact pile driving and pile removal and DTH operations (extrapolated from visual observation) at received levels greater than or equal to 120 dB or 160 dB re 1 µPa (rms) (respectively) with a discussion of any specific behaviors those individuals exhibited.
- Number of shut-downs throughout all monitoring activities.
- An estimate of the instances of exposure (by species) of ESA-listed marine mammals that: (A) are known to have been exposed to noise from pile driving/removal and DTH with a discussion of any specific behaviors those individuals exhibited, and (B) may have been exposed to noise from pile driving/removal and DTH with a discussion of the nature of the probable consequences of that exposure on the individuals that were or may have been exposed.
- A description of the implementation and effectiveness of each Term and Condition, as well as any conservation recommendations, for minimizing the adverse effects of the action on ESA-listed marine mammals.

11. CONSERVATION RECOMMENDATIONS

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

- 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 minimize the risk of vessel strikes. More information is available at https://alaskafisheries.noaa.gov/pr/whale-alert
- PR1 should summarize findings from past IHA holders about behavioral responses of ESA-listed species to sounds from DTH hammering. Better understanding of how ESA-listed species have responded to sounds from past projects will inform our exposure and response analyses in the future.

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

12. REINITIATION OF CONSULTATION

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

13. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

13.1 Utility

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

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

13.2 Integrity

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

13.3 Objectivity

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

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

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

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

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