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
Hoonah Cruise Ship and Lightering Dock Construction at Icy Strait Hoonah, AK

NMFS Consultation Number: AKRO-2018-00370

Action Agencies: National Marine Fisheries Service, Office of Protected Resources- Permits and Conservation Division (PR1), and
US Army Corps of Engineers, Alaska District (Corps)

Affected Species and Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is the Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Humpback Whale, Mexico DPS (*Megaptera novaeangliae*)	Threatened	Yes	N/A	No	N/A
Steller Sea Lion, Western DPS (*Eumatopias jubatus)*	Endangered	Yes	No	No	No
Sperm Whale *(Physeter microcephalus)*	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: __May 31, 2019________

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1. INTRODUCTION

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

Section 7(b)(3) of the ESA requires that at the conclusion of consultation, NMFS and/or USFWS provide an opinion stating how the Federal agency's action is likely to affect ESA-listed species and their critical habitat. If incidental take is reasonably certain to occur, section 7(b)(4) requires the consulting agency to provide an incidental take statement (ITS) that specifies the impact of any incidental taking, specifies those reasonable and prudent measures necessary or appropriate to minimize such impact, and sets forth terms and conditions to implement those measures.

In this document, the proposed actions and action agencies are:

- National Marine Fisheries Service (NMFS) Office of Protected Resources – Permits and Conservation Division's (PR1) proposed issuance of an Incidental Harassment Authorization (IHA) to take marine mammals by harassment under the Marine Mammal Protection Act (MMPA) incidental to Duck Point Development II, LLC's (DPD) proposed Hoonah Berth II Project, Hoonah, Alaska; and
- U.S. Army Corps of Engineers (USACE), Alaska District's proposed issuance of a Rivers and Harbors Act Section 10 and Clean Water Act Section 404 permit for the construction of a cruise ship dock, lightering float, and associated construction activities (Reference Number: POA-2018-00366).

The consulting agency for the proposed actions is NMFS's Alaska Region. The applicant is DPD. This document represents NMFS's biological opinion (opinion) on the effects of the proposed actions on endangered and threatened species and designated critical habitat.

The opinion and Incidental Take Statement (ITS) were prepared by NMFS in accordance with section 7(b) of the ESA of 1973, as amended (16 U.S.C. 1531-1544), and implementing regulations at 50 CFR Part 402.

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

1.1 Background

This opinion considers the effects of construction of a second cruise ship dock at Icy Strait Point, a lightering float (separate small craft float installed between two existing docks to add mooring capacity for small vessels), and associated construction activities and issuance of an IHA. These actions have the potential to affect the endangered western distinct population segment (DPS) of Steller sea lions and the threatened Mexico DPS of humpback whales. The nearest designated critical habitat for Steller sea lions is Benjamin Island located 60 kilometer (km) northwest of the project area.

This opinion is based on information provided in the Biological Assessment (BA) (Solstice 2018a), IHA notice (NMFS 2019), relevant reports, status reviews, stock assessment reports (Allen and Angliss 2018), the updated project proposals (Solstice 2019), email and telephone conversations between NMFS Alaska Region, NMFS PR1 staff, and the applicant; and other sources of information. A complete record of this consultation is on file at NMFS's Juneau, Alaska office.

1.2 Consultation History

On December 28, 2018, DPD submitted an IHA application to NMFS for the non-lethal taking of marine mammals in conjunction with their proposed construction of a cruise ship dock and lightering float at Icy Strait Point (Solstice, 2018). On April 3, 2019, DPD submitted a revised IHA application (Solstice, 2019). On May 2, 2019, NMFS's PR1 submitted a request to initiate section 7 consultation to the NMFS Alaska Region (NMFS). On January 10, 2019, the Corps submitted a request to initiate section 7 consultation regarding permit application POA-2018-00366, construction in Port Frederick, a navigable water of the United States. NMFS deemed the initiation packages complete and initiated consultation with PR1 and the Corps on May 2, 2019.

On May 30, 2019, NMFS Alaska Region provided PR1 and the Corps with a copy of the draft biological opinion on the suite of activities that would be permitted. NMFS Alaska Region reviewed all comments submitted and revised the opinion as warranted.

2. DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Project Overview

"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). No interrelated or interdependent actions identified in this analysis.

This opinion considers the effects of the DPD's construction of a cruise ship dock, lightering float, and associated construction activities, and authorization of an IHA to take marine mammals by harassment under the MMPA incidental to construction at Icy Strait Point in Hoonah, Alaska between June 1, 2019, and May 31, 2020. Activities include pile driving and removal (i.e., vibratory, impact, socketing, and rock anchoring) conducted between June 1 and November 30, 2019.

DPD proposes to increase mooring capacity at Cannery Point by constructing a new cruise ship berth, lightering float, associated support structures, and pedestrian walkway connections to shore. Some of these elements will be constructed onshore and/or above high tide line. See Table 2 for a list of project components included in this analysis.

2.1.2 Timing and Duration of the Project

Construction is expected to take about six months beginning in June 2019. Construction could be extended into fall of 2019 depending on the start date. Regardless of start date, construction will occur within a 6-month (maximum) work window.

Pile installation activities are expected to occur for a total of approximately 212 hours over 75 days (Table 3) (not necessarily consecutive days). The total construction duration accounts for the time required to mobilize materials and resources and construct the project. The duration also accounts for potential delays in material deliveries, equipment maintenance, inclement weather, and shutdowns that may occur to reduce impacts to marine mammals.

2.1.3 Proposed Activities

In-Water Construction Components

To construct a new cruise ship berth (Berth II), lightering float, associated support structures, and pedestrian walkway connections to shore, the project would require the following:

- Installation of 62 temporary 30-inch (in) diameter steel piles as templates to guide proper installation of permanent piles (these temporary piles would be removed prior to project completion);
- Installation of 8 permanent 42-in diameter steel piles, 16 permanent 36-in diameter steel piles, and 18 permanent 24-in diameter steel piles to support a new 500 feet (ft) x 50 ft floating pontoon dock, its attached 400 ft x 12 ft small craft float, mooring structures, and shore-access fixed-pier walkway;
- Installation of three permanent 30-in diameter steel piles to support a 120 ft x 20 ft lightering float;
- Removal of a single existing wood pile separate from the existing wooden pier by direct-pull methods using a crane;
- Socketing (down-the-hole drilling) and rock anchoring to stabilize the piles.

Project Vessels, Equipment, and Transportation

Materials and equipment, including the dock, would be transported from Seattle, Washington and from Skagway, Alaska to the project site by barge. Other vessels will transit to the work location from nearby projects near Sitka. Barge movements between pile installation areas (approximately 100 ft) would occur at a speed of less than 2 miles per hour. A material staging barge would be tied to the construction barge at the construction site, and materials would be moved from the staging barge to the construction barge and site by crane on the barge.

Table 1 shows the vessels that will be used during this project to support the activities described above. The barges will be used for construction. Workers will be transported from shore to the barge work platform by a 25-ft skiff with a 125–250 horsepower motor in the morning and at the end of the work day. The travel distance will be less than 300 ft. There could be multiple (up to eight) shore-to-barge trips during the day; however, the area of travel will be relatively small and close to shore. The other skiff will be used to enable PSO monitoring of the construction activities.

Table 1. Project Vessels

Vessel	Size	Project Purpose
Miller Bay	250 ft by 76 ft	Barge transporting materials from Skagway
Madison Bay	260 ft x 76 ft	Barge transporting materials
Swiftwater	230 ft by 60 ft by 15.5ft	Staging barge for construction arriving from Sitka
Brightwater	280ft by 76 ft by 16 ft	Crane barge for construction arriving from Sitka
1 skiff Exact vessel TBD	25-foot skiff with a 125–250 horsepower motor	Support construction activities and transfer crew arriving from Sitka
1 skiff Exact vessel TBD	25-35 ft skiff powered with 35-50 hp outboard motor	PSO monitoring

Equipment

DPD expects to use the following equipment:

- Vibratory Hammer: ICE 44B/Static weight 12,250 pounds
- Diesel Impact Hammer: Delmag D46/Max Energy 107,280 feet-pounds
- Drilled shaft drill: Holte 100,000 feet-pounds top drive with down-the-hole (DTH) hammer and bit
- Socket drill: Holte 100,000 feet-pounds top drive with DTH hammer and under-reamer bit

In-Water Construction Sequence
In-water construction of the cruise ship dock would begin with installation of an approximately 300-ft-long fixed pier. Temporary 30-in piles would be driven into the bedrock by a vibratory hammer to create a template to guide installation of the permanent piles. A frame would be welded around the temporary piles. Permanent 36-in and 42-in piles would then be driven into the bedrock using vibratory and impact pile driving.

Installation of the lightering float and fixed pier would begin with removal of a single existing wood pile separate from the existing wooden pier by direct-pull methods using a crane. We do not expect direct pulling to cause noise that rises to Level B harassment, so acoustic impacts of this removal are not analyzed herein. Three 30-in steel piles would then be driven in using a vibratory hammer in order to support the new lightering float structure. Additionally, (4) 16-in steel piles would be installed with a vibratory hammer (on land) for the lightering float's fixed pier and placement of a gangway to connect the two components. The 16-in steel piles are not discussed further because they occur on land and are not expected to impact species under water.

Installation and Removal of Temporary (Template) Piles
Temporary 30-in steel piles would be installed and removed using a vibratory hammer (Table 1). If needed for stability, the contractor would socket in up to 10 of these piles if a sufficient quantity of overburden is not present (Table 1). Socketing is also known as down-the-hole drilling or downhole drilling (DTH drilling) to secure a pile to the bedrock. During socketing, the DTH hammer and under-reamer bit drill a hole into the bedrock and then socket the pile into the bedrock. We refer to it as socketing throughout this document to clarify this method from rock anchoring, which also uses a drill.

Installation of Permanent Piles
Eighteen permanent 24-in steel piles would be installed to support the floating pontoon dock through sand and gravel with a vibratory hammer (Table 1). All of the 18 permanent 24-in steel piles will be secured into underlying bedrock with socketing (Table 1). Socket depths are expected to be approximately five ft (as determined by the geotechnical engineer). Two of the 24-in steel piles may also be secured through rock anchoring (Table 1). Rock anchoring is the method of drilling a shaft into the concrete, inside of the existing pile, and filling it with concrete to stabilize the pile. After a pile is impacted, the pile would be anchored using an 8-in diameter drilled shaft within the pile. Once the shaft is drilled, a DTH hammer with an 8-in diameter bit will be used to drill a shaft (depth as determined by geotechnical engineer) into the bedrock and filled with concrete to install the rock anchors.

Sixteen permanent 36-in steel piles and 8 permanent 42-in steel piles would be driven through sand and gravel with a vibratory hammer and impacted into bedrock (Table 1). After being impacted, all 24 of these piles would be anchored using a smaller 33-in diameter drilled shaft within the pile (Table 1). Once the shaft is drilled, a DTH hammer with a 33-in diameter bit (isolated from the steel casing) will be used to drill a shaft (depth as determined by geotechnical engineer) into the bedrock and filled with concrete to install the rock anchors. During this anchor drilling, the larger diameter piles would not be touched by the drill; therefore, anchoring will not generate steel-on-steel hammering noise (noise that is generated during socketing).

In addition, 3 permanent 30-in steel piles would be driven through sand and gravel with a vibratory hammer only to support the lightering float at the second location (Table 2 and Figure 4). The total amount of time using each of the installation methods is shown in Table 3. NMFS assumes that only one installation method occurs at a time, and within a 24-hour period, in order to estimate accumulated sound exposure.

Table 2. Pile driving and removal activities required for the Hoonah Berth II and lightering float.

Description	Project Component					
	Temporary Pile Installation	**Temporary Pile Removal**	**Permanent Pile Installation**	**Permanent Pile Installation**	**Permanent Pile Installation**	**Permanent Pile Installation**
Diameter of Steel Pile (inches)	30	30	24	30	36	42
# of Piles	62	62	18	3	16	8
Vibratory Pile Driving						
Total Quantity	62	62	18	3	16	8
Max # Piles Vibrated per Day	6	6	4	2	2	2
Impact Pile Driving						
Total Quantity	0	0	0	0	16	8
Max # Piles Impacted per Day	0	0	0	0	4	2
Socketed Pile Installation (Down-Hole Drilling)						
Total Quantity	10	0	18	0	0	0
Max # Piles Socketed per Day	2	0	2	0	0	0
Rock Anchor Installation (Drilled Shaft)						
Total Quantity	0	0	2	0	16	8
Diameter of Anchor	--	--	8	0	33	33
Max # Piles Anchored per Day	0	0	1	0	2	2

Table 3. Estimated Number of Hours and Work Days[1] Required by Installation Method

Description	Project Component						
	Temporary Pile Installation	**Temporary Pile Removal**	**Permanent Pile Installation**	**Permanent Pile Installation**	**Permanent Pile Installation**	**Permanent Pile Installation**	**Max Installation/ Removal per Day**
Diameter of Steel Pile (inches)	30	30	24	30	36	42	--
# of Piles	62	62	18	3	16	8	--
Vibratory Pile Driving							
Total Quantity	62	62	18	3	16	8	--

Description	Project Component						
	Temporary Pile Installation	**Temporary Pile Removal**	**Permanent Pile Installation**	**Permanent Pile Installation**	**Permanent Pile Installation**	**Permanent Pile Installation**	**Max Installation/ Removal per Day**
Max # Piles Vibrated per Day	6	6	4	2	2	2	6
Vibratory Time per Pile	20 min	10 min	10 min	30 min	30 min	60 min	--
Vibratory Time per Day	120 min	60 min	40 min	60 min	60 min	120 min	120 min
Vibratory Time Total (39 days)	1,240 min	620 min	180 min	90 min	480 min	480 min	--
Impact Pile Driving							
Total Quantity	0	0	0	0	16	8	--
Max # Piles Impacted per Day	0	0	0	0	4	2	4
# of Strikes per Pile	0	0	0	0	100	135	--
Impact Time per Pile	0	0	0	0	2.5 min	3 min	--
Impact Time per Day	0	0	0	0	10 min	6 min	10 min
Impact Time Total (8 days)	0	0	0	0	40 min	24 min	--
Socketed Pile Installation (Down-Hole Drilling)							
Total Quantity	10	0	18	0	0	0	--
Max # Piles Socketed per Day	2	0	2	0	0	0	2
Socket Time per Pile	60 min	0	60 min	0	0	0	--
Socket Time per Day	120 min	0	120 min	0	0	0	240 min
Socket Time Total (14 days)	600 min	0	1,080 min	0	0	0	--
Rock Anchor Installation (Drilled Shaft)							
Total Quantity	0	0	2	0	16	8	--
Anchor Diameter	--	--	8”	0	33”	33”	--
Max # Piles Anchored per Day	0	0	1	0	2	2	2
Anchor Time per Pile	0	0	60 min	0	240 min	240 min	--
Anchor Time per Day	0	0	60 min	0	480 min	480 min	480 min
Anchor Time Total (14 days)	0	0	120 min	0	3,840 min	~~2,~~1,920 min	--

[1]Total work days 39 + 8 + 14 + 14 = 75

Cumulative Effects

After construction is complete, the new cruise ship dock will result in an increase in the number of cruise ships that transit to and from the area, and the construction of the new lightering float will increase the number of small vessels providing whale watching and other vessel-based tourism opportunities in the area. Increases in local cruise ship traffic and whale watching activity do not require authorization as part of this action, nor do they require subsequent federal authorization that would be subject to future consultation under section 7 of the ESA. These effects would not happen but for the action under consideration here, and are therefore addressed in our analysis on cumulative effects (Section 7), which are considered along with the status of the species, the effects of the action, and the environmental baseline in assessing the risk the action poses to ESA-listed species and critical habitat.

2.1.4 Mitigation Measures

NMFS and the Corps worked together to develop the following mitigation measures to minimize the potential impacts to marine mammals from the project's activities, by:

1. Minimizing sound levels from project activities;
2. Monitoring marine mammals within designated zones of influence corresponding to NMFS's Level A (injury) and Level B (behavioral) harassment thresholds under the MMPA;
3. Following NMFS's regulations and guidelines to prevent vessel strike;
4. Including best management practices (BMPs) for oil spill prevention; and
5. Reporting details about the effectiveness of the project's mitigation and the number of harassed marine mammals to NMFS.

2.1.5 Minimizing Sound Levels from Project Activities

General Conditions for Pile Driving Activities[1]

- Pile cushion-- DPD will use a softening material (e.g., high-density polyethylene or ultra-high-molecular weight polyethylene) on all templates to eliminate steel on steel noise generation during impact pile driving.
    - Soft start for impact pile driving-- Soft-start procedures could provide additional protection to marine mammals by warning or giving marine mammals a chance to leave the area prior to the impact hammer operating at full capacity. For impact pile driving, DPD will provide an initial set of 3 strikes from the impact hammer at 40 percent energy, followed by a one-minute waiting period, then two subsequent 3-

[1] Pile driving activities, for purposes of these mitigation measures, include vibratory and impact pile driving, pile removal, drilling, socketing, anchoring, and other in-water heavy construction. These activities will be referred to generically as "pile driving activities" for the remainder of this mitigation measures section.

strike sets. This soft-start will be applied prior to beginning pile driving activities each day or when impact pile driving hammers have been idle for more than 30 minutes. Soft Start is not required during vibratory pile driving and removal activities.

- DPD will drive all piles with a vibratory hammer until a desired depth is achieved or refusal prior to using an impact hammer.
- DPD will use the minimum impact hammer energy needed to safely install the piles.

  DPD is required to conduct briefings for construction supervisors and crews, the monitoring team, and DPD staff prior to the start of all pile driving activity, and when new personnel join the work, in order to explain responsibilities, communication procedures, the marine mammal monitoring protocol, and operational procedures.
- All work must be conducted during daylight hours. If poor environmental conditions restrict visibility full visibility of the shutdown zone, pile installation must be delayed.
  - Monitoring and Shutdown Zones

Shutdown Zone for in-water Heavy Machinery Work
There is potential for physical injury to marine mammals from in-water heavy machinery work (using, *e.g.*, movement of the barge to the pile location; positioning of the pile on the substrate via a crane (*i.e.*, stabling the pile), removal of the pile from the water column/substrate via a crane (*i.e.*, deadpull); or placement of sound attenuation devices around the piles) and vessels transiting between shore and the barge work platform.

While NMFS does not expect any of these other in-water construction and heavy machinery activities will take marine mammals as these activities occur close to the shoreline (less than 300 ft), there will be a 10-m shutdown zone for construction-related activity where acoustic injury is not an issue, monitored by the PSO at the dock construction site or lightering float construction site when construction activities are occurring. This type of work could include (but is not limited to) the following activities:

(1) movement of the barge to the pile location;

(2) positioning of the pile on the substrate via a crane (i.e., stabbing the pile);

(3) removal of the pile from the water column/substrate via a crane (i.e., deadpull);

(4) transportation of crew to/from work sites; and

(5) the placement of sound attenuation devices around the piles.

For these activities, monitoring would take place from 15 minutes prior to initiation until the action is complete.

Protected Species Observers (PSOs)
- PSOs will be present in the action area during all vibratory pile removal and vibratory, impact, socketing, and anchoring installation. Monitoring will be conducted by PSOs from on land and from a vessel. The number of PSOs will vary from three to four, depending on the type of pile driving, method of pile driving, and size of pile, as

specified below.

- Three PSOs will monitor during all impact pile driving activity at the lightering float project site.
- Three PSOs will monitor during all impact pile driving activities at the cruise ship dock project site.
- Three PSOs will monitor during vibratory pile driving of 24-in and 30-in steel piles.
- Four PSOs will monitor during vibratory pile driving of 36-in and 42-in steel piles piles and during all socketing/rock anchoring activities.
- Three PSOs will monitor during all pile driving activities at the lightering float project site, with locations as follows: PSO #1: stationed at or near the site of pile driving; PSO #2: stationed on Long Island (southwest of Hoonah in Port Frederick Inlet) and positioned to be able to view west into Port Frederick Inlet and north towards the project area; and PSO #3: stationed on a vessel traveling a circuitous route through the Level B monitoring zone (Figure 3).
- Three PSOs will monitor during all impact pile driving activities at the Berth II project site, with locations as follows: PSO #1: stationed at or near the site of pile driving; PSO #2: stationed on Halibut Island (northwest of the project site in Port Frederick Inlet) and positioned to be able to view east towards Icy Strait and southeast towards the project area; and PSO #3: stationed on a vessel traveling a circuitous route through the Level B monitoring zone (Figure 3).
- Three PSOs will monitor during vibratory pile driving of 24- and 30-in steel piles at the cruise ship dock project site, with locations as follows PSO #1: stationed at or near the site of pile driving; PSO #2: stationed on Scraggy Island (northwest of the project site in Port Frederick Inlet) an positioned to be able to view south towards the project area; and PSO#3: stationed on a vessel traveling a circuitous route through the Level B monitoring zone.
- Four PSOs will monitor during vibratory pile driving of 36-in and 42-in steel piles and during all socketing/rock anchoring activities with locations as follows: PSO #1: stationed at or near the site of pile driving; PSO #2: stationed on Hoonah Island (northwest of the project site in Port Frederick Inlet) and positioned to be able to view south towards the project site; PSO #3: stationed across Icy Strait north of the project site (on the mainland or the Porpoise Islands) and positioned to be able to view west into Icy Strait and southwest towards the project site; and PSO #4: stationed on a vessel traveling a circuitous route through the Level B monitoring zone.

- Monitoring locations will be selected to provide an unobstructed view of all water within the shutdown zone and as much of the Level B harassment zone as possible for pile driving activities.
- To ensure that the action area has been surveyed for Steller sea lion and humpback whale presence, pile driving/removal will not begin until a PSO has given a notice to proceed to project personnel.

- Prior to pile driving, the action area will be surveyed for Steller sea lion and humpback whale presence for 30 minutes. If either is sighted within or approaching a shutdown zone during this 30-minute survey period prior to pile driving, or during the soft-start, DPD will delay pile driving/removal until the animal(s) is confirmed to have moved outside of and on a path away from the area or if 30 minutes have elapsed since the last sighting of the animal within the shutdown zone.
- Shutdowns will be implemented if a Steller sea lion or humpback whale appears likely to enter a shutdown zone.
- Independent PSOs (*i.e.*, not construction personnel) who have no other assigned tasks during monitoring periods must be used. Other PSOs may substitute education (degree in biological science or related field) or training for experience.
  - Where a team of three or more PSOs are required, a lead observer or monitoring coordinator must be designated. The lead observer must have prior experience working as a marine mammal observer during construction.
  - DPD must submit PSO CVs for approval by NMFS prior to the onset of pile driving.
  - PSOs must have the following additional qualifications:
  - Ability to conduct field observations and collect data according to assigned protocols.
  - 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, times, and reason for implementation of mitigation (or why mitigation was not implemented when required); 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.

Shutdown Zones

For all pile driving/removal and drilling (socketing and anchoring) activities, a shutdown zone will be established for humpback whales and Steller sea lions that is greater than its corresponding Level A take zone (i.e., activities would shut down before a listed species enters the zone where we would expect injury to occur). The shutdown zone is intended to encompass the area within which Sound Pressure Levels (SPL) equal or exceed the auditory injury criteria for cetaceans and pinnipeds. The calculated Permanent Threshold Shift (PTS) isopleths were rounded up to the nearest five meters to determine the actual shutdown zones that the applicant will operate under (Table 4). For Steller sea lions the actual calculated distance for the Level A harassment zone was less than 10m for many of the installation methods (Table 4). In those circumstances where the level A zone was <10m, a conservative distance of 10 m was used as the shutdown zone to be consistent and precautionary. The purpose of a shutdown zone is generally to define an area within which work will cease (shutdown of the activity occurs upon sighting of a marine mammal or in anticipation of an animal entering the defined area).

The shutdown zones for humpback whales and Steller sea lions during each of the pile driving, pile removal, and drilling (socketing and anchoring) activities are as shown in Table 4 and Figure 1 and 2.

Table 4. Shutdown Zones during Project Activities to avoid Level A take (Solstice, 2019).

Sound Source	**Shutdown Zones (radial distance in meters, area in km^2)**	
	Humpback Whales	Steller Sea Lions
In-Water Construction Activities		
Barge movements, pile positioning, sound attenuation placement*	10 m (0.00093 km^2)	10 m (0.00093 km^2)
Vibratory Pile Driving/Removal		
24-in steel installation (18 piles; ~40 min per day on 4.5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
30-in steel temporary installation (62 piles; ~2 hours per day on 10.5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
30-in steel removal (62 piles; ~1 hour per day on 10.5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
30-in steel permanent installation at lightering float (3 piles; ~1 hour per day on 1.5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
36-in steel permanent installation (16 piles; ~1 hour per day on 8 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
42-in steel permanent installation (8 piles; ~2 hours per day on 4 days)	50 m (0.02307 km^2)	10 m (0.00093 km^2)
Impact Pile Driving		
36-in steel permanent installation (16 piles; ~10 minutes per day on 4 days)	1,000 m (2.31 km^2)	50 m (0.02307 km^2)

Sound Source	Shutdown Zones (radial distance in meters, area in km^2)	
	Humpback Whales	Steller Sea Lions
42-in steel permanent installation (8 piles; ~6 minutes per day on 4 days)	750 m (1.44 km^2)	50 m (0.02307 km^2)
Socketed Pile Installation		
24-in steel permanent installation (18 piles; ~2 hours per day on 9 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
30-in steel temporary installation (up to 10 piles; ~2 hours per day on 5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
Rock Anchor Installation		
8-in anchor permanent installation (for 24-inch piles, 2 anchors; ~1 hour per day on 2 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
33-in anchor permanent installation (for 36- and 42-inch piles, 24 anchors; ~8 hours per day on 12 days)	100 m (0.0875 km^2)	10 m (0.00093 km^2)

Figure 1. Level A Shutdown Zones at the Lightering Float construction site. Zones described in Table 2.

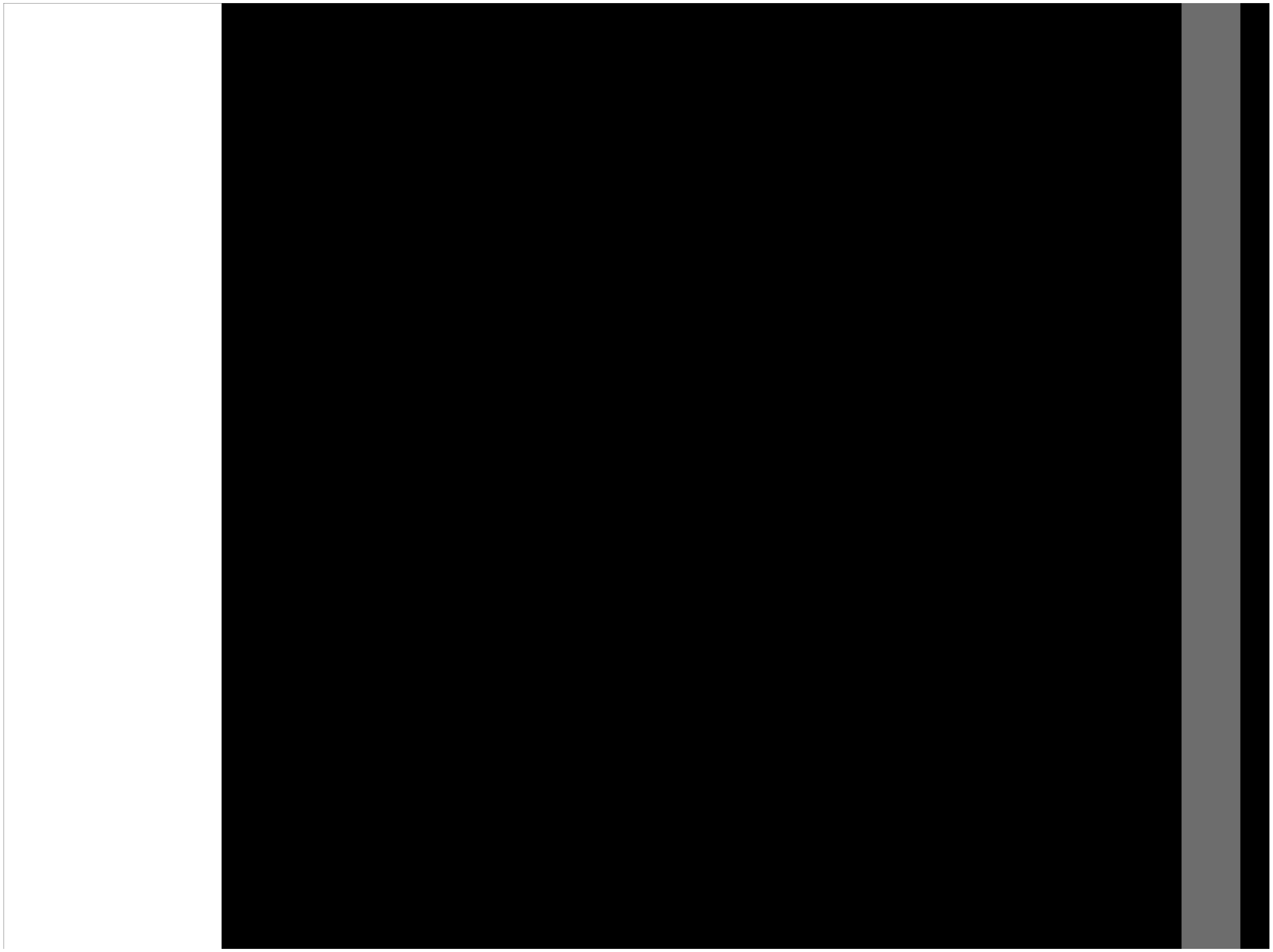

Figure 2. Level A Shutdown Zones at the cruise ship construction site. Zones described in Table 2.

2.1.6 Level B Monitoring Zones

PR1 is requesting take by Level B harassment of Steller sea lions and humpback whales incidental to constructing Berth II and the lightering float. Shutdowns associated with Level B harassment of these species are not proposed. The monitoring zones associated with Level B harassment are outlined in Table 5 and Figures 11-14.

Table 5. Level B Monitoring Zones calculated using the Practical Spreading Model and rounded up.

Source	Monitoring Zones (meters)*
Vibratory Pile Driving/Removal	
24-inch steel installation (18 piles; ~40 min per day on 4.5 days)	6,215
30-inch steel temporary installation (72 piles; ~2 hours per day on 12 days)	6,215
30-inch steel removal (72 piles; ~1 hour per day on 12 days)	6,215
30-inch steel permanent installation (3 piles; ~1 hour per day on 1.5 days)	6,215
36-inch steel permanent installation (20 piles; ~1 hour per day on 10 days)	16,345
42-inch steel permanent installation (10 piles; ~2 hours per day on 5 days)	16,345
Impact Pile Driving	
36-inch steel permanent installation (20 piles; ~10 minutes per day on 5 days)	3,745
42-inch steel permanent installation (10 piles; ~6 minutes per day on 5 days)	3,745
Socketed Pile Installation	
24-inch steel permanent installation (18 piles; ~2 hours per day on 9 days)	12,025
30-inch steel temporary installation (up to 10 piles; ~2 hours per day on 5 days)	12,025
Rock Anchor Installation	
8-inch anchor permanent installation (for 24-inch piles, 2 anchors; ~1 hour per day on 2 days)	12,025
33-inch anchor permanent installation (for 36 -inch piles, 30 anchors; ~8 hours per day on 15 days)	12,025
33-inch anchor permanent installation (for 42-inch piles, 30 anchors; ~8 hours per day on 15 days)	12,025

*Numbers rounded up to nearest 5 meters.

[redacted]

Figure 3. Figure 3. Level B Monitoring Zones described in Table 5.

2.1.7 Following NMFS's regulations and guidelines to prevent vessel strike

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:

- 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 at a slow, safe speed when near a humpback whale (safe speed is defined in regulation [see 33 CFR § 83.06]).

Vessels will also follow the NMFS Marine Mammal Code of Conduct (accessible at https://www.fisheries.noaa.gov/alaska/marine-life-viewing-guidelines/alaska-marine-mammal-viewing-guidelines-and-regulations) 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.

2.1.8 Best Management Practices for Oil and Spill Prevention

- The contractor will provide and maintain a spill cleanup kit on-site at all times, to be implemented as part of the DBD Brightwater Shipboard Oil Pollution Emergency Plan for oil spill prevention and response (Turnagain Marine Construction 2018).
- Fuel hoses, oil drums, oil or fuel transfer valves and fittings, and similar equipment will be checked regularly for drips or leaks, and will be maintained and stored properly to prevent spills.
- Oil booms will be readily available for oil or other fuel spill containment should any release occur.
- All chemicals and petroleum products will be properly stored to prevent spills.
- No petroleum products, cement, chemicals, or other deleterious materials will be allowed to enter surface waters.

2.1.9 Reporting details about the effectiveness of the project's mitigation and the number of harassed marine mammals to NMFS

PR1 and the Corps will provide the applicant's final report on all monitoring conducted during the activities analyzed in this opinion by January 1, 2020. This report must contain the informational elements described in the Marine Mammal Monitoring Plan, dated April 2019, including, but not limited to:

- Dates and times (begin and end) of all marine mammal monitoring.
- Construction activities occurring during each daily observation period, including how many and what type of piles were driven or removed and by what method (*i.e.*, impact or vibratory).
- Weather parameters and water conditions during each monitoring period (*e.g.,* wind speed, percent cover, visibility, sea state).
- The number of marine mammals observed, by species, relative to the pile location and if pile driving or removal was occurring at time of sighting.
- Age and sex, if possible, of all marine mammals observed.
- PSO locations during marine mammal monitoring.
- Distances and bearings of each marine mammal observed to the pile being driven or removed for each sighting (if pile driving or removal was occurring at time of sighting).
- Description of any marine mammal behavior patterns during observation, including direction of travel.
- Number of individuals of each species (differentiated by month as appropriate) detected within the monitoring zone, and estimates of number of marine mammals taken, by species (a correction factor should be used to estimate the total take numbers, as appropriate).
- Detailed information about any implementation of any mitigation triggered (e.g., shutdowns and delays), a description of specific actions that ensued, and resulting behavior of the animal, if any.
- Description of attempts to distinguish between the number of individual animals taken and the number of incidences of take, such as ability to track groups or individuals.

Reporting injured or dead marine mammals:

In the unanticipated event that the specified activity clearly causes the take of a marine mammal in a manner prohibited by this IHA, such as serious injury, or mortality, DPD must immediately cease the specified activities and report the incident to the Alaska Region Stranding Coordinator ((877) 925-7773) and NOAA Office of Protected Resources. The report must include the following information:

- Time and date of the incident;
- Description of the incident;
- Environmental conditions (e.g., wind speed and direction, Beaufort sea state, cloud cover, and visibility);

- Description of all marine mammal observations and active sound source use 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).

Activities must not resume until NMFS is able to review the circumstances of the prohibited take. NMFS will work with DPD to determine what measures are necessary to minimize the likelihood of further prohibited take and ensure MMPA compliance. DPD may not resume their activities until notified by NMFS.'

In the event DPD discovers an injured or dead marine mammal, and the lead observer 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), DPD must report the incident to the Alaska Region Stranding Coordinator ((877) 925-7773) and NOAA Office of Protected Resources, immediately. Activities may continue while NMFS reviews the circumstances of the incident. NMFS will work with DPD to determine whether additional mitigation measures or modifications to the activities are appropriate.

In the event that DPD discovers an injured or dead marine mammal, and the lead observer determines that the injury or death is not associated with or related to the specified activities (e.g., previously wounded animal, carcass with moderate to advanced decomposition, or scavenger damage), DPD must report the incident to Alaska Region Stranding Coordinator ((877) 925-7773) and NOAA Office of Protected Resources within 24 hours of the discovery.

2.2 Action Area

The project is located on Cannery Point in Southeast Alaska's Chichagof Island, 64 kilometers (40 miles) southwest of Juneau. Cannery Point is located approximately 2.4 kilometers (1.5 miles) north of Hoonah on the shore where Port Frederick Inlet and Icy Strait converge (Figure 4).

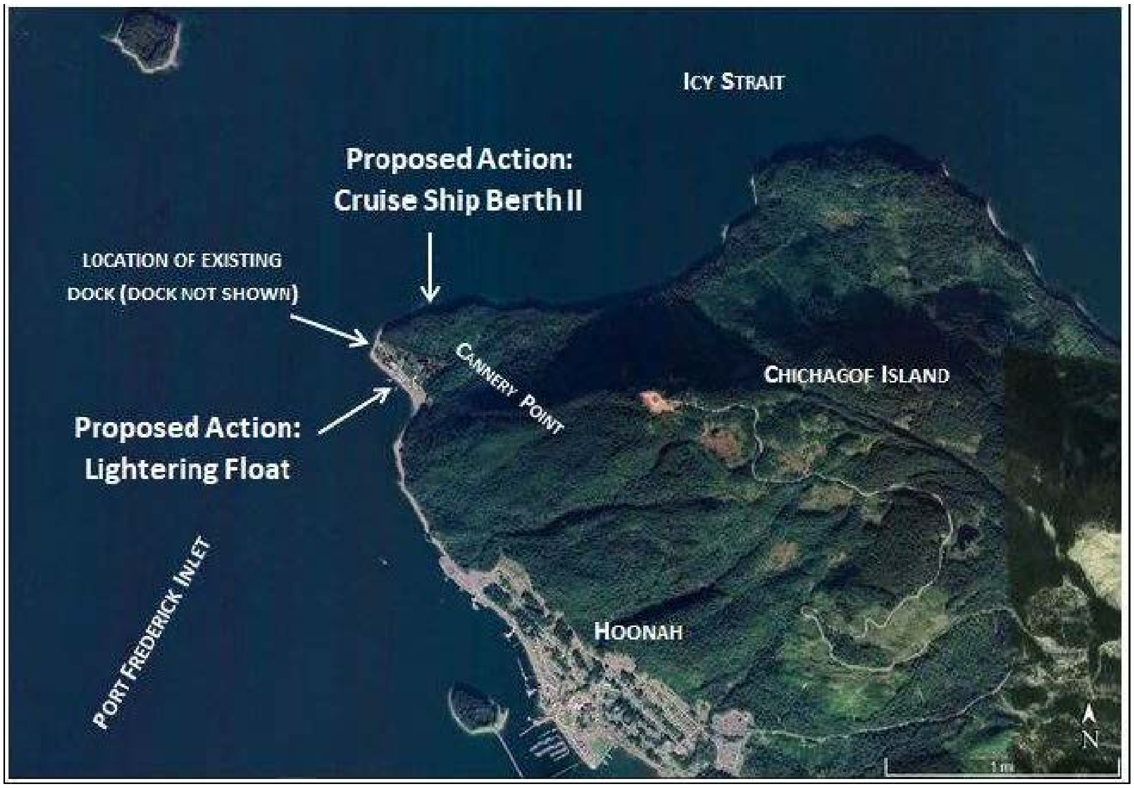

Figure 4. Detailed Map of Project Components near Hoonah, Alaska.

Icy Strait is part of Alaska's Inside Passage, a route for ships through Southeast Alaska's network of islands, located between Chichagof Island and the North American mainland in the Alexander Archipelago. Port Frederick is a 24-kilometer inlet that dips into northeast Chichagof Island from Icy Strait, leading to Neka Bay and Salt Lake Bay. The inlet varies between 4 and almost 6 kilometers wide with a depth of up to 150 meters. The inlet is 14 to 35 meters deep near the proposed project (NOAA 2018).

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

The Action area for this project (Figure 5) includes:

(1) the cruise ship berth construction site;

(2) a sound propagation buffer around the cruise ship berth construction site;

(3) the lightering float construction site;

(4) a sound propagation buffer around the lightering float construction site;

(5) vessel transit routes between local dock and construction sites with a 100 yard humpback whale avoidance buffer;

(6) vessel transit routes to and from the project with a 100 yard humpback whale avoidance buffer.

We define the action area for this consultation to include the area within which project-related noise levels are ≥120 dB re 1 µPa (rms), and are expected to approach ambient noise levels (i.e., the point where no measurable effect from the project would occur). Based on PR1's modeled sound propagation estimates, received levels from vibratory driving of 36- and 42-inch steel piles (the farthest-reaching noise associated with the project) are expected to decline to 120 dB within 16.345 kilometers from the source (NMFS User Spreadsheet). This distance is truncated where land- masses obstruct underwater sound transmission (Figure 5).

The action area encompasses approximately 245 square kilometers in Port Frederick Inlet and Icy Strait (Figure 5).

[redacted]

Figure 5. Action Area including potential transportation routes.

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

We use the following approach to determine whether the proposed action described in Section 2.1 is likely to jeopardize listed species:

- Identify those aspects (or stressors) of the proposed action that are likely to have direct or indirect effects on listed species. 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 likely to be adversely affected by the proposed action. This section describes the current status of each listed species relative to the conditions needed for recovery. Species 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. 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. 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 appreciably reduce the likelihood of both survival and recovery of the species in the wild by reducing its numbers, reproduction, or distribution. 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 conclusion. Conclusions regarding jeopardy 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, 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. This opinion considers the effects of the proposed action on these species and critical habitats (Table 6).

Table 6. Listing status and critical habitat designation for marine mammals considered in this opinion.

Species	Status	Listing	Critical Habitat
Western DPS Steller sea lion (*Eumetopias jubatus*)	Endangered	NMFS 1990 (55 FR 49204) NMFS 1997 (62 FR 24345)	Not present in the action area NMFS 1993 (58 FR 45269)
Mexico DPS humpback whale (*Megaptera novaeangliae*)	Threatened	NMFS 1970 (35 FR 18319) NMFS 2016 (81 FR 62260)	Not designated
Sperm whale *(Physeter microcephalus)*	Endangered	NMFS 1970 (35 FR 8491)	Not designated

4.1 Species and Critical Habitat Not Likely to be Adversely Affected

Sperm Whales

Tagged sperm whales have been tracked within the Gulf of Alaska, and multiple sperm whales have been tracked in Chatham Strait, in Icy Strait, and in the action area in 2014 and 2015 (http://seaswap.info/whaletracker Accessed 5/27/19). Southeast Alaska Sperm Whale Avoidance Project (SEASWAP) data is shown in Figure 6.

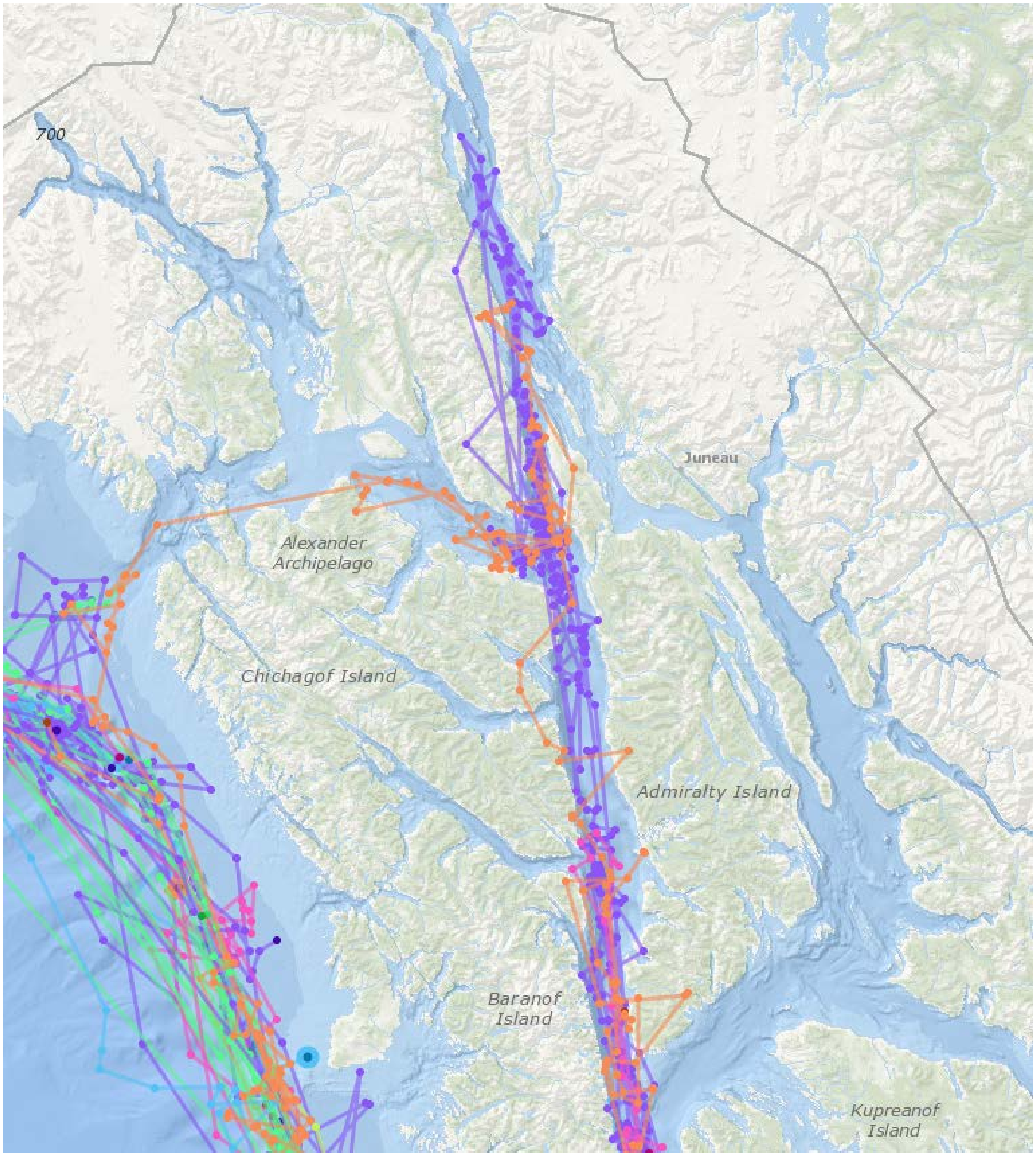

Figure 6. SEASWAP data of sperm whales moving in and around Southeast Alaska. This research is conducted under NOAA Permit Number 18529, issued to Jan Straley.

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 action area for this project includes sperm whale habitat (these shelf-edge/slope waters of the Gulf of Alaska) only for transportation of equipment to the project site near Hoonah, Alaska (Figure 5).

More recently in November 2018 (4 whales) and March 2019 (2 whales), sperm whales have been observed in southern Lynn Canal, and on March 20, 2019, NMFS performed a necropsy on a sperm whale in Lynn Canal that died from trauma consistent with a ship strike.

It is likely that the project transportation routes could overlap with sperm whale movements, but NMFS predicts that the risk of vessel strike and acoustic harassment will be reduced because of the project details and mitigation measures for the following reasons:

- While project vessels will transit in deeper waters where sperm whales are more likely to occur, the barges associated with the project are slow moving vessels, reducing potential for collisions. Also, all project vessels will adhere to NMFS's guidelines for approaching marine mammals, which discourage vessels from approaching within 100 yards of marine mammals.
- NMFS expects that it is very unlikely that sperm whales will occupy ensonified zones during the short-term construction activities, due to sperm whales' affinity for deeper waters as described above. Very limited data is available, but they suggest that the likelihood of spatial overlap is low.
- A small number of vessels are associated with construction over 75 days from June 1, 2019 through the fall of 2019. Once construction has begun, movement in the action area is limited to short distances at slow speeds for barges, and in very shallow near-shore waters for crew transport on the skiff.
- NMFS has determined that noise generated from the vessels used in this action does not rise to Level B harassment levels (Section 6.2). The amount of noise from the barges and support vessels is expected to be an incremental and inconsequential addition to existing vessel noise in the area.

In summary, vessel noise associated with the proposed action would have immeasurably small effects on sperm whales, this species is not likely to be in the ensonified area during construction, and ship strike is extremely unlikely to occur. Therefore, any effects of this action to sperm whales are insignificant and discountable, and NMFS concurs that this action is not likely to adversely affect sperm whales.

Steller Sea Lion Critical Habitat

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

1. Terrestrial zones that extend 3,000 feet (0.9 km) landward from each major haulout and major rookery in Alaska.
2. Air zones that extend 3,000 feet (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska.
3. Aquatic zones that extend 3,000 feet (0.9 km) seaward of each major haulout and major rookery in Alaska that is east of 144^{o} W longitude.

4. Aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144º W longitude.
5. Three special aquatic foraging areas: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area, as specified at 50 CFR § 226.202(c).

The action area includes marine transportation routes that could overlap with Steller sea lion critical habitat that includes a terrestrial zone, an aquatic zone, and an air zone that extend 3,000 feet (0.9 km) landward, seaward, and above, respectively, each major rookery and major haulout (shown in hot pink in Figure 5). No other aspects of the action area overlap with designated critical habitat.

NMFS analyzed the potential effects to critical habitat from the stressors associated with the permitted activities in this project as follows:

- Sound fields produced by impulsive and continuous noise sources from construction activities - There are no designated haulouts or rookeries within or near the ensonified zones produced by the construction associated with this project. The closest haulout is Benjamin Island, located 60 km northwest of the project area. NMFS considers any effects to critical habitat to be discountable due to the lack of spatial overlap.
- Sound fields produced by continuous noise from vessel traffic – Vessels travelling to and from the project site may come within the vicinity of the Critical Habitat sites shown in Figure 5, but not within 3,000 feet of shore. Also, NMFS has determined that vessel noise from this project does not rise to Level B harassment for any listed species.
- NMFS has determined that any habitat changes including water quality and turbidity is insignificant and that the potential pollution from unauthorized spills is discountable due to the mitigation measures included in the project.
- NMFS has determined that the risk of vessel strike is discountable due to the mitigation measures included in the project.

In summary, stressors associated with the proposed action have only insignificant and discountable effects to critical habitat, and NMFS concurs that this action is not likely to adversely affect Steller sea lion critical habitat.

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 project. 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 explicit, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (Pachauri and Reisinger 2007).

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

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

The indirect effects of climate change on WDPS Steller sea lions and 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.

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.

More detailed background information on the status of these species can be found in a number of published documents including stock assessment reports on Alaska marine mammals by Allen and Angliss (2015), and recovery plans for humpback whales (NMFS 1991) and Steller sea lions (NMFS 2008).

4.3.1 Mexico DPS Humpback Whales

Population Structure and Status

The humpback whale was listed as endangered under the Endangered Species Conservation Act (ESCA) on December 2, 1970 (35 FR 18319). Congress replaced the ESCA with the ESA in 1973, and humpback whales continued to be listed as endangered. NMFS recently conducted a global status review and changed the status of humpback whales under the ESA. The globally listed species was divided into 14 DPSs, four of which are endangered, one is threatened, and the remaining 9 are not listed under the ESA (81 FR 62260; September 8, 2016).

Three humpback whale DPSs occur in Alaska waters. The Hawaii DPS is no longer listed as endangered or threatened, the Mexico DPS is listed as threatened, and the Western North Pacific DPS is listed as endangered.

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

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

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

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

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 (WNP), 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.

Distribution

Humpback whales are found in all ocean basins worldwide, and typically occur in tropical and subtropical waters during the winter and migrate seasonally to high latitudes during the summer to feed (Allen and Angliss 2014) (Figure 7). An exception to this generality is that a number of humpbacks have been observed over-wintering in certain areas of Alaska, including Prince William Sound, where they take advantage of winter/spring herring runs (J. Moran, pers. comm. April 28, 2016; see also http://www.afsc.noaa.gov/Quarterly/CurrentIssue/tocABL.htm). In their summer foraging areas and winter calving areas, humpback whales tend to occupy shallower, coastal waters. However, during their seasonal migrations, humpback whales disperse widely in deep, pelagic waters and tend to avoid shallower coastal waters (Winn and Reichley 1985).

Relatively high densities of humpback whales occur throughout much of Southeast Alaska and northern British Columbia, particularly during the summer months (Allen and Angliss 2015). The abundance estimate for humpback whales in the Southeast Alaska is estimated to be 6,137 (CV= 0.07) animals, which includes whales from the Hawaii DPS (~94%) and Mexico DPS (~6%) (Wade et al. 2016). Although migration timing varies among individuals, most whales depart for Hawaii or Mexico in fall or winter and begin returning to Southeast Alaska in spring, with continued returns through the summer and a peak occurrence in Southeast Alaska during late summer to early fall. However, there are significant overlaps in departures and returns (Baker et al. 1985; Straley 1990). Humpback whales in the Gulf of Alaska number between 1,755 and 2,487 animals.

Humpback whales have been observed throughout much of the shelf waters (waters over the continental shelves) of the Bering Sea, but densities of humpbacks appear relatively low in the northern shelf area, with relatively few sightings north of St. Lawrence Island (Friday et al. 2013; Moore et al. 2002; Moore et al. 2000b). Humpback whales are consistently concentrated in coastal waters north of Unimak Pass (Friday et al. 2012). In the Aleutian Islands, there are high densities of humpback whales in the eastern Aleutians, but the densities decline in the western Aleutian Islands (Zerbini et al. 2006). Interchange was seen during the SPLASH project between the eastern Aleutians and the Bering Sea, and there were no genetic differences between the areas (Baker et al. 2013).

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

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

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

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

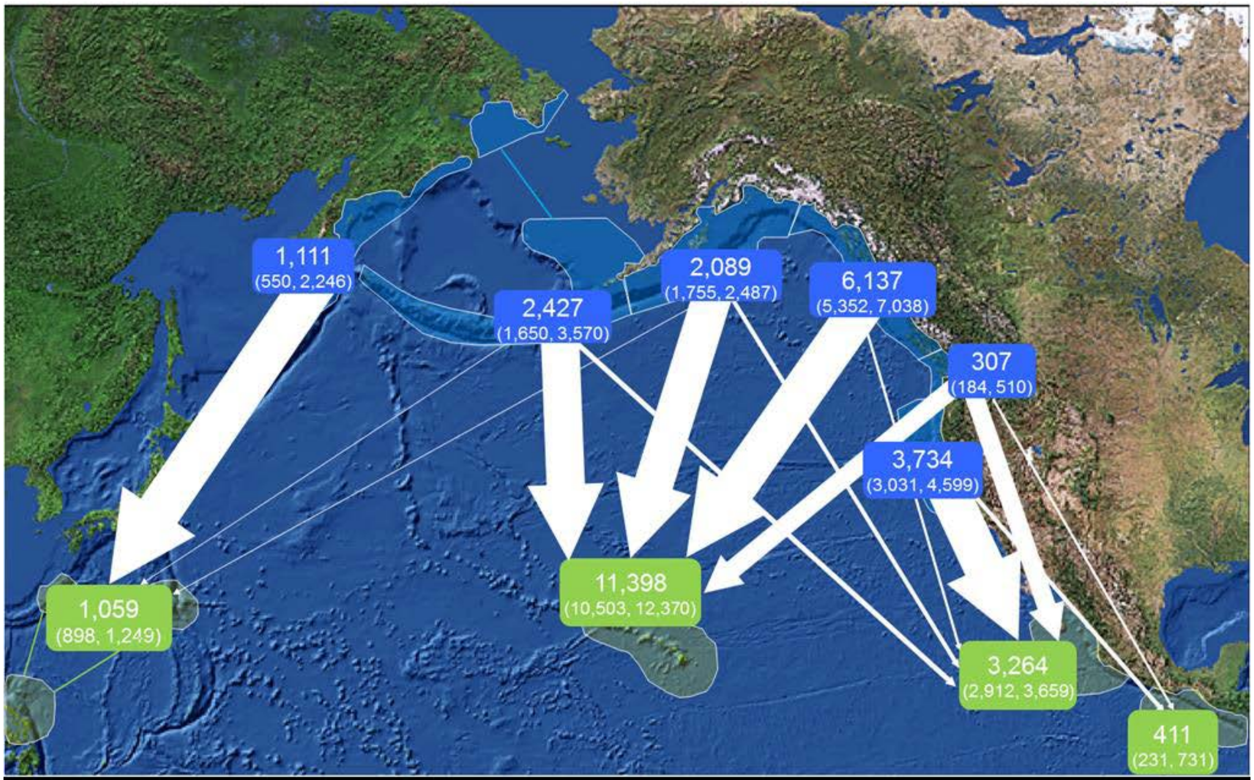

Figure 7. Abundance by summer feeding areas (blue), and winter breeding areas (green), with 95% confidence limits in parentheses. Migratory destinations from feeding area to breeding area are indicated by arrows with width of arrow proportional to the percentage.

Threats to the Species

Natural Threats

There is limited information on natural phenomena that kill or injure humpback whales. Humpback whales are killed by orcas (Whitehead and Glass 1985, Dolphin 1987b, Florezgonzalez et al. 1994, Naessig and Lanyon 2004), and are probably killed by false killer whales and sharks. Calves 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).

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

Entrapments in ice have been documented in the spring ice pack in Newfoundland (Merdsoy et al. 1979), and up to 25 entrapped in the same event (Lien and Stenson 1986), and some mortalities have been reported. No humpback ice entrapments have been reported in the Chukchi Sea.

Anthropogenic Threats

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

There are no reported takes of humpback whales from the WNP or Mexico DPS by subsistence hunters in Alaska or Russia for the 2010-2014 period (Muto et al. 2017).

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).

Brownell et al. (2000) compiled records of bycatch in Japanese and Korean commercial fisheries between 1993 and 2000. During the period 1995-99, there were six humpback whales indicated as “bycatch”. In addition, two strandings were reported during this period. Furthermore, analysis of four samples from meat found in markets indicated that humpback whales were being sold. At this time, it is not known whether any or all strandings were caused by incidental interactions with commercial fisheries; similarly, it is not known whether the humpback whales identified in market samples were killed as a result of incidental interactions with commercial fisheries. It is also not known which fishery may be responsible for the bycatch. Regardless, these data indicate a minimum mortality level of 1.1/year (using bycatch data only) to 2.4/year (using bycatch, stranding, and market data) in the waters of Japan and Korea. Because many mortalities pass unreported, the actual rate in these areas is likely much higher. An analysis of entanglement rates from photographs collected for SPLASH found a minimum entanglement rate of 31% for humpback whales from the Asia breeding grounds (Cascadia Research 2003).

Humpback whales are also killed, injured, and entangled during interactions with commercial fishing gear. In Alaska, interactions resulting in entanglements, mortality, or serious injury of humpback whales occurred in the following fisheries between 2010-2014: BSAI flatfish trawl, BSAI pollock trawl, Southeast Alaska salmon drift gillnet, Pacific cod jig, Bering Sea pot gear, Prince William Sound shrimp pot gear, and Gulf of Alaska Dungeness crab pot gear (Muto et al. 2017). Pot and trap gear are the most commonly documented source of mortality and serious injury to humpback whales off the U.S. West Coast outside of Alaska (Carretta et al. 2017). A photography study of humpback whales in southeastern Alaska in 2003 and 2004 found at least 53% of individuals showed some kind of scarring from entanglement (Neilson et al. 2005).

Strandings of humpback whales entangled in fishing gear or with injuries caused by interactions with gear are another source of mortality data. However, very few stranding reports are received from areas west of Kodiak. The mean annual human-caused mortality and serious injury rate for

2008-2012 based on fishery and gear entanglements reported in the NMFS Alaska Regional Office stranding database is 0.3 (Allen and Angliss 2015). These events have not been attributed to a specific fishery listed on the List of Fisheries (76 FR 73912; 29 November 2011). The estimated annual mortality rate due to interactions with all fisheries is 0.9 (0.6 + 0.3).

Other sources of human-caused mortality and serious injury include reported collisions with vessels and entanglement in marine debris. The mean minimum annual human-caused mortality and serious injury rate for 2008-2012 for the WNP DPS based on vessel collisions (0.45) and entanglement in unknown marine debris/ gear (0.8) reported in the NMFS Alaska Regional Office stranding database is 1.25 (Allen and Angliss 2015).

Vessel collisions with humpback whales remain a significant management concern, given the increasing abundance of humpback whales foraging in Alaska, as well as the growing presence of marine traffic in Alaska’s coastal waters. Based on these factors, injury and mortality of humpback whales as a result of vessel strike may likely continue into the future (NMFS 2006).

Reproduction and Growth

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

Although long-term relationships do not appear to exist between males and females, mature females do pair with other females; those individuals with the longest standing relationships also have the highest reproductive output, possibly as a result of improved feeding cooperation (Ramp et al. 2010).

Feeding and Prey Selection

Humpback whales tend to feed on summer grounds and not on winter grounds. However, some opportunistic winter feeding has been observed at low latitudes (Perry et al. 1999). Humpback whales engulf large volumes of water and then filter small crustaceans and fish through their fringed baleen plates.

Humpback whales are relatively generalized in their feeding compared to some other baleen whales. In the Northern Hemisphere, known prey includes: euphausiids (krill); copepods; juvenile salmonids; Arctic cod; walleye pollock; pteropods; and cephalopods (Johnson and Wolman 1984, Perry et al. 1999). Foraging is confined primarily to higher latitudes (Stimpert et al. 2007), such as the action area.

Diving and Social Behavior

In Hawaiian waters, humpback whales remain almost exclusively within the 1800 m isobath and usually within water depths less than 182 meters. Maximum diving depths are approximately 170 m (558 ft) (but usually <60 m [197 ft]), with a very deep dive (240 m [787 ft]) recorded off

Bermuda (Hamilton et al. 1997). They may remain submerged for up to 21 min (Dolphin 1987a). Dives on feeding grounds ranged from 2.1-5.1 min in the north Atlantic (Goodyear unpublished manuscript). In southeast Alaska average dive times were 2.8 min for feeding whales, 3.0 min for non-feeding whales, and 4.3 min for resting whales, with the deepest dives to 148m (Dolphin 1987a), while whales observed feeding on Stellwagen Bank in the North Atlantic dove <40m (Hain et al. 1992). Because most humpback prey is likely found above 300 m depths most humpback dives are probably relatively shallow. Hamilton et al. (1997) tracked one possibly feeding whale near Bermuda to 240 m depth.

In a review of the social behavior of humpback whales, Clapham (1996) reported that they form small, unstable social groups during the breeding season. During the feeding season they form small groups that occasionally aggregate on concentrations of food. Feeding groups are sometimes stable for long periods of time. There is good evidence of some territoriality on feeding (Clapham 1994, 1996) and calving areas (Tyack 1981). In calving areas, males sing long complex songs directed towards females, other males or both. The breeding season can best be described as a floating lek or male dominance polygyny (Clapham 1996). Inter-male competition for proximity to females can be intense as expected by the sex ratio on the breeding grounds which may be as high as 2.4:1.

Average group size near Kodiak Island is 2-4 individuals, although larger groups are seen near Shuyak and Sitkalidak islands and groups of 20 or more have been documented (Wynne et al. 2005). Humpback whales observed in the Alaska Chukchi Sea have been single animals and one cow calf pair was observed in the U.S. Beaufort Sea (Hashagen et al. 2009). Average group size in the action area is discussed in the Exposure Analysis that follows.

Vocalization and Hearing

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

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

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

4.3.2 Western DPS Steller Sea lion

More detailed background information on the status of WDPS Steller sea lions can be found in a stock assessment report on Alaska marine mammals by Allen and Angliss (2018) and the recovery plan for Steller sea lions (NMFS 2008a). The Steller sea lion (*Eumetopias jubatus*) 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*.

Population Structure and Distribution

NMFS reclassified Steller sea lions as two distinct population segments under the ESA in 1997 based on demographic and genetic dissimilarities—the western and eastern DPSs (62 FR 24345, May 5, 1997). The WDPS, extending from Japan around the Pacific Rim to Cape Suckling in Alaska (144° W) (Figure 8), was listed as endangered due to its continued decline and lack of recovery. This endangered status listing was supported by a population viability analysis that indicated that a continued decline at the 1985 to 1994 rate would result in extinction of the WDPS in 100 years. The probability of extinction was 65% if the 1989 to 1994 trend continued for 100 years (62 FR 24345, 24346).

The eastern Distinct Population Segment (EDPS), extending from Cape Suckling (144° W) east to British Columbia and south to California, remained on the list as threatened because of concern over WDPS animals ranging into the east, the larger decline overall in the U.S. population, human interactions, and the lack of recovery in California (62 FR 24345). The EDPS continued to recover, and NMFS removed the EDPS from the list of threatened species on November 4, 2013 (78 FR 66140), since the recovery criteria in the Steller Sea Lion Recovery Plan (NMFS 2008) were achieved and the DPS no longer met the definition of a threatened species under the ESA. Because the EDPS is no longer listed under the ESA, effects from this action on that DPS are not analyzed herein.

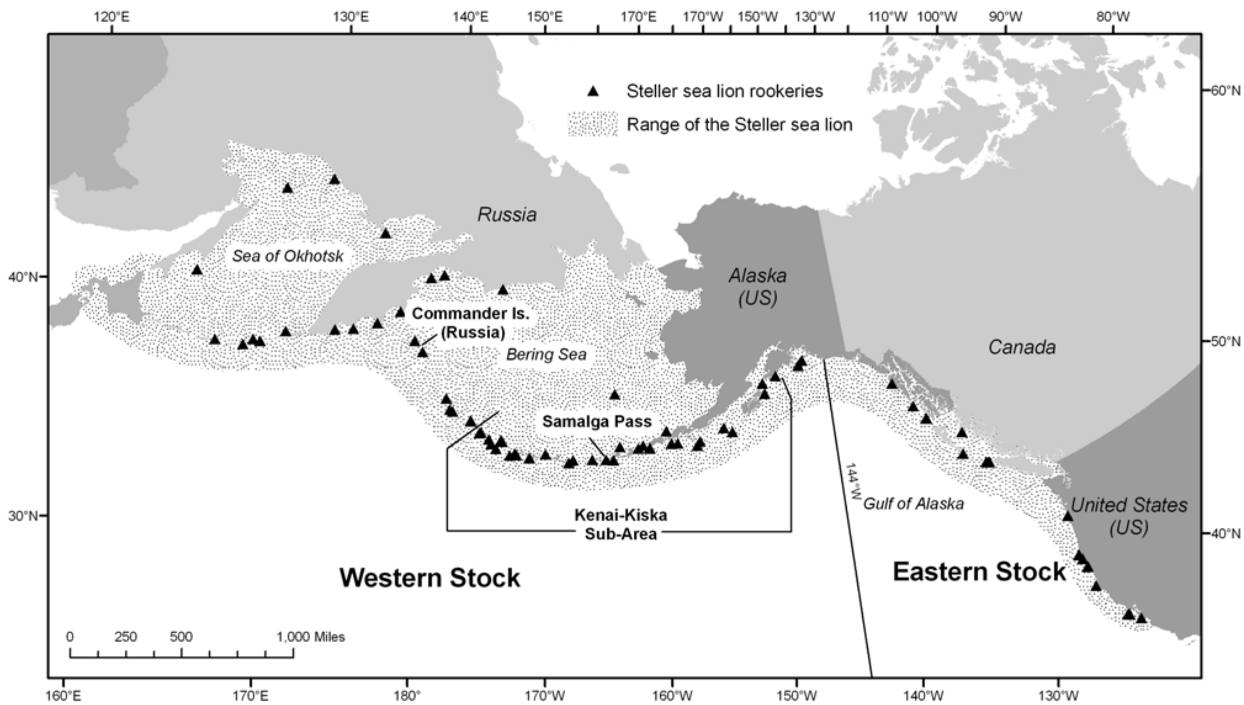

Figure 8. Steller sea lion range and breeding sites (rookeries) in the North Pacific Ocean.

Reproduction and Growth

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

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

The best available data from the eastern GOA suggest that birth rate is similar to pre-decline birth rates, while the best available data from the central GOA suggest that the birth rate continues to decline steadily relative to 1976 levels. Thus, while longitudinal studies or population models may provide an insight into the likely birth rate for a particular time and area, the extent to which these estimates apply to areas of the WDPS range lacking age-structured information is unknown.

Feeding and Prey Selection

Steller sea lions consume a variety of demersal, semi-demersal, and pelagic prey, indicating a potentially broad spectrum of foraging styles, probably based primarily on availability. Overall, the available data suggest two types of distribution at sea by Steller sea lions: 1) less than 20 km (12 mi) from rookeries and haulout sites for adult females with pups, pups, and juveniles, and 2) much larger areas (greater than 20 km [12 mi]) where these and other animals may range to find optimal foraging conditions once they are no longer tied to rookeries and haulout sites for nursing and reproduction. Loughlin (1993) observed large seasonal differences in foraging ranges that may have been associated with seasonal movements of prey, and Merrick (1995) concluded on the basis of available telemetry data that seasonal changes in home range were related to prey availability.

Diving and Social Behavior

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

Vocalization and Hearing

The ability to detect sound and communicate underwater is important for a variety of Steller sea lion life functions, including reproduction and predator avoidance. 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 2010). An underwater audiogram shows the typical mammalian U-shape. Higher hearing thresholds, indicating poorer sensitivity, were observed for signals below 16 kHz and above 25 kHz (Kastelein *et al.* 2005).

Critical Habitat

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

As discussed in Section 4.1, NMFS concurs that this action is not likely to adversely affect Steller sea lion critical habitat.

WDPS Status and Trends

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

In Alaska, the decline spread and intensified east and west of the eastern Aleutians in the 1980s. Steller sea lion regions in Alaska are depicted in Figure 9. Between 1991 and 2000, overall counts of Steller sea lions at trend sites decreased 40 percent, an average annual decline of 5.4 percent (Loughlin and York 2000). In the 1990s, counts decreased more at the western (western Aleutians: -65%) and eastern edges (eastern and central GOA: -56% and -42%, respectively) of the U.S. range than they did in the center (range of -24% to -6% from the central Aleutians through the western Gulf of Alaska) (Fritz *et al.* 2008). The decline continued in the WDPS until about 2000.

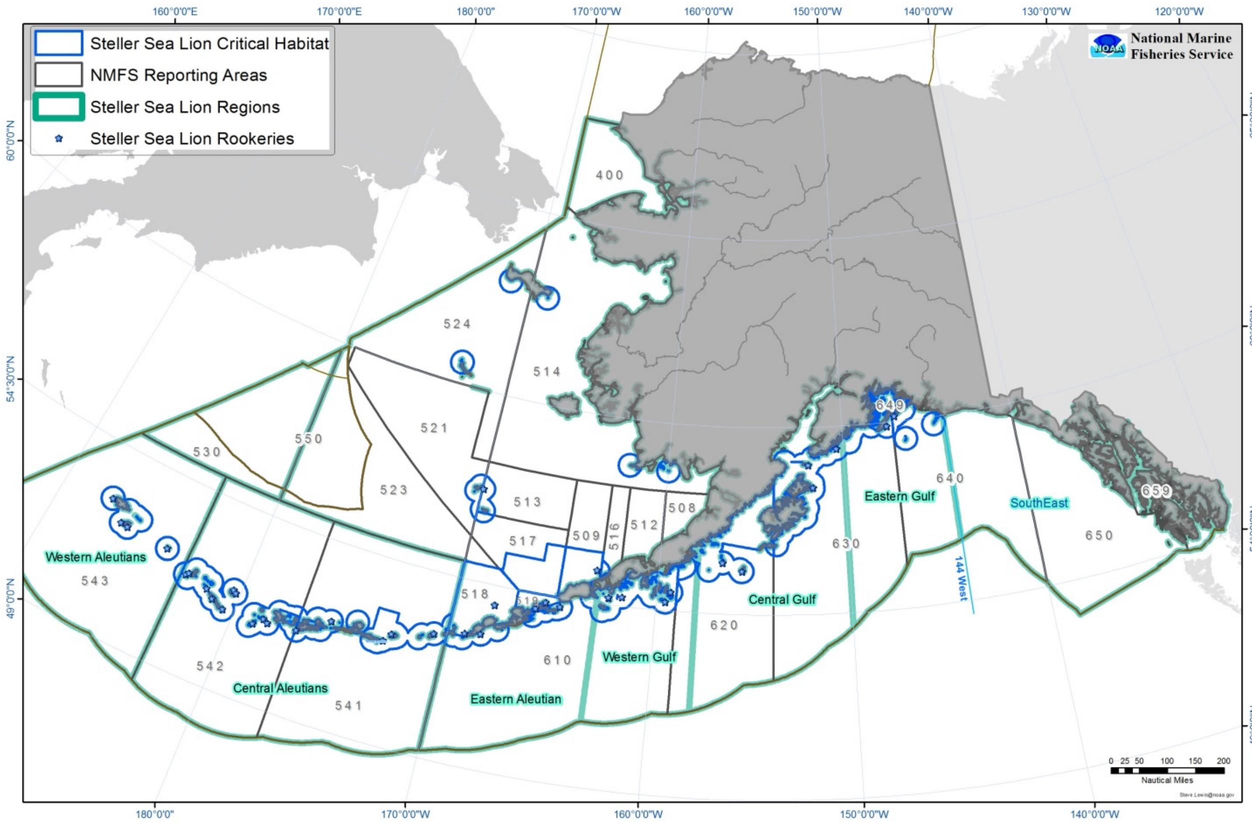

Figure 9. Sub-regions used by NMFS to monitor status and trends of the WDPS in Alaska.

Table 8. Average annual rates of change in non-pup and pup counts of WDPS Steller sea lion non-pups and pups in Alaska, by Recovery Plan sub-region, from 2000 through 2012 (Source: Fritz *et al.* (2013)). Shaded cells denote delineated Recovery Plan sub-regions.

Region	Longitude Range	Non-pups			Pups		
		Trend	-95%	+95%	Trend	-95%	+95%
WDPS in Alaska	144°W-172°E	1.67	1.01	2.38	1.45	0.69	2.22
East of Samalga Pass	144-170°W	2.89	2.07	3.8	–	–	–
Eastern Gulf of Alaska	144-150°W	4.51	1.63	7.58	3.97	1.31	6.5
Central Gulf of Alaska	150-158°W	0.87	-0.34	2.18	1.48	-0.56	3.3
E-C Gulf of Alaska	144-158°W	2.4	0.92	3.86	–	–	–
Western Gulf of Alaska	158-163°W	4.01	2.49	5.42	3.03	1.06	5.2
Eastern Aleutian Islands	163-170°W	2.39	0.92	3.94	3.3	1.76	4.83
W Gulf and E Aleutians	158-170°W	3.22	2.19	4.25	–	–	–
West of Samalga Pass	170°W-172°E	-1.53	-2.35	-0.66	–	–	–
Central Aleutian Islands	170°W-177°E	-0.56	-1.45	0.43	-0.46	-1.5	0.72
Western Aleutian Islands	177°E - 172°E	-7.23	-9.04	-5.56	-9.23	-10.93	-7.78

An estimate of the abundance of the entire (U.S. and Russia) WDPS of Steller sea lions (pups and non-pups) in 2012 can be calculated by adding the most recent U.S. and Russian pups counts, and multiplying by 4.5 (11,603 + 6,021 = 17,624 pups × 4.5), which yields 79,300 sea lions.

WDPS Trend in the U.S. (Alaska)

NMFS monitors the status of the WDPS by conducting aerial surveys of Steller sea lion rookery and haulout sites during the breeding season (June through mid-July), extending the series of surveys that began in Alaska in the mid-1970s (Braham *et al.* 1980, Calkins and Pitcher 1982, Loughlin *et al.* 1992, Merrick *et al.* 1987). Trends in sea lion population abundance have been determined by analyzing a time series of pup and non-pup counts at "trend" sites that have been consistently surveyed since the 1970s, 1990s, and 2000s (Fritz *et al.* 2013, NMFS 2008). Trend sites include all rookeries and major haulouts in the WDPS and have included a larger number of sites since Steller sea lions were listed under the ESA and since the surveys became more comprehensive. A description of the survey methods and number of sites in each trend site grouping is provided in Fritz *et al.* (2013).

Table 9. Aerial survey counts of adult and juvenile (non-pup) Steller sea lions observed at 1970s trend sites (as described in Fritz *et al.* (2013)) by sub-region in Alaska in June and July from 1976 to 2012.

	Gulf of Alaska			Aleutian Islands				
Year	Eastern	Central	Western	Eastern	Central	Western	Kenai-Kiska	Western
1976-1979	7,053	24,678	8,311	19,743	36,632	14,658	89,364	111,075
1985		19,002	6,275	7,505	21,956	4,526[1]	54,738	
1989								
1990	5,444	7,050	3,915	3,801	7,988		22,754	
1991	4,596	6,270	3,732	4,228	7,496	3,083	21,726	29,405
1992	3,738	5,739	3,716	4,839	6,398	2,869	20,692	27,299
1994	3,365	4,516	3,981	4,419	5,820	2,035	18,736	24,136
1996	2,132	3,913	3,739	4,715	5,524	2,187	17,891	22,210
1998	2,110[2]	3,467	3,360	3,841	5,749	1,911	16,417	20,438
2000	1,975	3,180	2,840	3,840	5,419	1,071	15,279	18,325
2002	2,500	3,366	3,221	3,956	5,480	817	16,023	19,340
2004	2,536	2,944	3,512	4,707	5,936	898	17,099	20,533
2006	2,773			4,721				
2007	2,505		4,114					
2008	3,726	3,176	4,153	5,040	4,932[3]	589	17,301	21,616
2009	3,362	3,683						
2010E	2,951	3,173				516		
2010L	4,716							
2011	4,385[4]		5,014[5]					
2012						455		

[1] Includes 1988 count at Buldir
[2] Includes 1999 counts for those sites not surveyed in 1998
[3] Includes 2006 count at Amchitka/East Cape of 99 animals (adjusted)
[4] Includes 2010L counts at Rugged and Seal Rocks (Kenai) (total of 63 animals adjusted)
[5] Includes 2008 count at Castle Rock of 27 animals (adjusted)

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 2014).

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 (Dahlheim and White 2010, Ford *et al.* 1998, Heise *et al.* 2003, Horning and Mellish 2012, Maniscalco *et al.* 2007, Matkin *et al.* 2007, Springer *et al.* 2008, Williams *et al.* 2004).

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 *et al.* 2003) and 5% (NMFS 2013) of the remains found in deceased killer whale stomachs in the GOA. Matkin *et al.* (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 6 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.* (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. There is no new information on disease in the WDPS relative to the information in the BiOp for the Fishery Management Plan (FMP) for the Gulf of Alaska (FMP BiOp) (NMFS 2010).

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

Anthropogenic Threats

Fishing Gear and Marine Debris Entanglement
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked interactions with fishing gear and marine debris as a low threat to the recovery of the WDPS. Helker *et al.* (2015) report 352 cases of serious injuries to EDPS Steller sea lions from interactions with fishing gear, mostly from troll gear and other marine debris between 2009 and 2013. These interactions occur in fisheries that are not observed. Raum-Suryan *et al.* (2009) found 386 animals either entangled in marine debris or having ingested fishing gear over the period 2000-2007 in Southeast Alaska and northern British Columbia.

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 observer data (31) and stranding data (2.2) where observer 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 2015).

In order to better understand the interactions between salmon fisheries (categorized in the List of Fisheries as having occasional incidental mortality or serious injury of marine mammals) and marine mammals, the Alaska Marine Mammal Observation Program (AMMOP) implemented an observer program to observe the salmon driftnet fishery in Prince William Sound and the Copper River Delta in 1991. The program observed approximately 5% of estimated net retrievals, and extrapolated marine mammal interactions to estimate that 83 marine mammals (95% CI = 7 to 296) were injured or killed in that fishery between May 16 and September 1, 1991 (Wynne *et al.* 1992). Unfortunately that program is no longer funded, and more recent data is not available.

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 sea lions. It is generally well accepted that commercial fisheries target several important Steller sea lion prey species

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

Subsistence/Native Harvest

The Steller Sea Lion Recovery Plan (NMFS 2008) ranked subsistence harvest as a low threat to the recovery of the WDPS. The most recent subsistence harvest data were collected by the Alaska Department of Fish and Game through 2008 and by the Ecosystem Conservation Office of the Aleut Community of St. Paul through 2009. The mean annual subsistence take from the WDPS in Alaska over the 5-year period from 2004 through 2008, combined with the mean take over the 2005–2009 period from St. Paul, was 199 Steller sea lions/year (Allen and Angliss 2015).

Illegal Shooting

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

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. These incidents in the Copper River Delta were investigated and referred to the U.S. Attorney’s Office in Alaska for criminal prosecution. Two individuals (the vessel captain and a crewmember) were charged and pled guilty to violations of the Marine Mammal Protection Act.

PRD 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 AKR assessed on the Copper River Delta from May 10 to August 9, 2016 and from May 18 to August 17, 2017 (Wright and Savage 2017, 2018). 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 did drop considerably between 2015 and 2016, and may be a result of increased OLE, PRD, and USCG presence and activity in the Delta.

Mortality and Disturbance from Research Activities
The Steller Sea Lion Recovery Plan (NMFS 2008) ranked effects from research activities as a low threat to the recovery of the WDPS. Mortalities may occur incidental to marine mammal research activities authorized under ESA and MMPA permits issued to a variety of government, academic, and other research organizations. Between 2006 and 2010, there were no mortalities resulting from research on the WDPS of Steller sea lions (Allen and Angliss 2015).

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

Climate Change and Ocean Acidification
Marine ecosystems are susceptible to impacts from climate change and ocean acidification linked to increasing CO_2 emissions including increasing global anthropogenic CO_2 emissions. As discussed in the FMP BiOp (NMFS 2010), 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 a Biological Opinion on the Fishery Management Plan of the Gulf of Alaska NMFS (2010).

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).

The occurrence, numbers, and habitat use of Steller sea lion and humpback whale have been described above. This summary of the environmental baseline complements the information provided in the *Status of The Species* section of this opinion, and provides the background necessary to understand information presented in the *Effects of the Action* and *Cumulative*

Effects sections. We then evaluate these consequences in combination with the baseline to determine the likelihood of jeopardy.

There are several natural and anthropogenic factors which have affected and may continue to affect humpback whales and Steller sea lions within the action area. Some of those activities, most notably shooting of Steller sea lions, occurred extensively in the past, although the effects of these reductions likely persist today. Other human activities are ongoing and appear to continue to affect populations of humpback whales and Steller sea lions. NMFS is unaware of any other federal projects that have undergone formal or early consultation or contemporaneous state/private actions in the action area.

5.1 Stressors that affect Humpback Whales in the Action Area

5.1.1 Entanglement in Fishing Gear

As discussed above, entanglement in fishing gear is a geographically wide-spread threat to humpback whales. The minimum average annual mortality and serious injury rate due to interactions with all fisheries in 2011-2015 is 18 Central North Pacific stock of humpback whales (8.5 in commercial fisheries + 0.7 in recreational fisheries + 0.3 in subsistence fisheries + 8.8 in unknown fisheries) (Allen and Angliss 2018).

Between 2001 and 2005, 53 incidents of humpback whale entanglement were reported in northern and southeastern Alaska, making the US fishery-related minimum annual mortality and serious injury rate 3.2 humpbacks for the Central North Pacific stock (Angliss, 2008).

An assessment by Neilson et al. (2009) found that 78% of whales in northern southeastern Alaska had been non-lethally entangled in fishing gear. Between 2003 and 2004, 8% of whales in the Glacier Bay and Icy Strait area acquired new entanglement related scars (Neilson et al., 2009). Calves were found to have lower scarring rates but are thought to have more lethal encounters with entanglement. The results of the study also show that males may have a higher rate of entanglement than females, but it is not known why this difference exists or if it is real and will persist over time (Neilson et al., 2009).

[redacted]

Figure 10. Recorded vessel strikes of humpback whales in the action area and surrounding waters, opportunistic sightings of humpback whales and Steller sea lions, survey data, haulouts and project monitoring and shut-down zones.

5.1.2 Vessel Strikes and Disturbance

The action area experiences moderate levels of marine vessel traffic with highest volumes occurring May through September. Marine vessels that use the action area include passenger ferries, whale watching tour boats, charter fishing vessels, cruise ships, and kayaks (NMFS 2015). The Alaska Marine Highway System (AMHS) offers year-round service to Hoonah. The state ferry docks at Hoonah Marina, owned by the City of Hoonah, which also serves local fishing boats and other private marine vessels.

Cruise ships are the largest vessels that routinely use the action area. The historic Hoonah Packing Company Cannery was redeveloped in the early 2000s by the Huna Totem Corporation at Icy Strait Point, as a cruise ship destination and tourist attraction. With the completion of the first cruise ship birth in 2016, ship visits have increased from 34 in 2004 to a projected 122 visits in 2019 (Alaska Business Monthly 2018). Icy Strait Point averages one cruise ship mooring per day in the high season (May-September), with 107 scheduled stops in 2018 (Icy Strait Point 2018).

Vessel Strikes

Available evidence suggests that ship strikes are increasing in Alaska (Gabriele et al., 2007). From 1978-2006, 62 collisions were reported in Alaskan waters, involving a wide range of vessel types and large whale species (Gabriele et al., 2007). The most commonly reported vessel type was small private boats less than 15m in length. However, this trend may be influenced by reporting and not accurately reflect the true frequency of vessel type involved. Of the 62 collisions, 49 had unknown outcomes and 11 collisions resulted in death of the whale. 46 of the 62 reported collisions involved humpback whales (Gabriele et al., 2007). Ship strikes were estimated to account for 1.8 mortality/serious injuries per year in 2013 (Allen and Angliss, 2014).

Neilson et al (2012) summarized 93 total (reported) humpback-vessel collisions in Alaska from 1978–2011, of which 17 are known to have resulted in the whale's death. Analysis of all whale species and vessel collisions showed that small vessel strikes were most common (<15 m, 60%), but medium (15–79 m, 27%) and large (≥80 m, 13%) vessels also struck whales. They found a significant increase in the number of reports over time between 1978 and 2011 (regression, $r2 = 0.6999$, $df = 32$, $P<0.001$). Most strikes ($n = 98$, 91%) occurred in May through September and there were no reports from December or January. The majority of strikes ($n = 82$, 76%) were reported in southeastern Alaska, where the number of humpback whale collisions increased 5.8% annually from 1978 to 2011. Vessel strikes recorded in and near the action area are shown in Figure 10.

Disturbance

The current Icy Strait Point facility has been operating as a port of call for cruise ship passengers since 2004. The facility gets about 72 vessel calls per 90-day season each year. Once at Icy Strait Point, passengers partake in a variety of excursions including whale watching tours to Icy Strait and nearby Point Adolphus. Point Adolphus is a very popular area for whale watching, charter fishing and kayak tours in the summer months. The whale watching tours originating at Icy Strait Point have created a noticeable increase in small and medium vessel traffic at Point

Adolphus (C. Gabriele, pers. comm).

Systematic whale counts have been undertaken in the area since 1985 by biologists from Glacier Bay National Park and Preserve. Until 2013, whale counts were increasing along with whale population growth in Southeast Alaska, but in recent years, there has been a sharp decline in the number of whales near Point Adolphus (Neilson et al. 2014, 2015 in press). There are no published findings on the effects of the increase in whale watching vessel traffic at Point Adolphus although reports of whale harassment and collisions with whales have been documented (Neilson et al. 2013, 2014). Despite the decrease in whale numbers, it appears that the same number of tours still go to Point Adolphus from Icy Strait Point, focusing on a much smaller number of whales, which has the potential to disproportionately affect those individuals via acoustic and behavioral disturbance (C. Gabriele, pers. comm).

5.1.3 Climate Change

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

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

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

5.2 Stressors that affect Steller Sea lions in the Action Area

5.2.1 Illegal shooting

Illegal shooting of listed species occurs to an unknown extent in the action area. The Steller Sea Lion Recovery Plan (NMFS 2008) ranked illegal shooting as a low threat to the recovery of the western DPS. 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.

On June 1, 2015, the NMFS Alaska Marine Mammal Stranding 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 located two additional Steller sea lion carcasses, which may also have been intentionally killed.

In April 2018, two men were criminally charged in connection with the 2015 case. They were charged with harassing and killing Steller sea lions with shotguns and then making false statements and obstructing the government's investigation into their criminal activities. In late June 2018, the men plead guilty to criminal charges.

NMFS Alaska Region designed survey plans for the Copper River Delta in 2016-2018 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 known cause of death of the pinnipeds assessed on the Copper River Delta from May 10 to August 9, 2016 and from May 18 to August 17, 2017 (Wright and Savage 2017, 2018).. It is unlikely that the presence of the carcasses observed in the 2016 and 2017 surveys would have been reported without these dedicated surveys in this remote area. Without dedicated monitoring in past years it is impossible to know whether intentional killings by humans increased in 2015- 2017 relative to prior years. Numbers of marine mammals found dead with evidence of human interaction dropped considerably between 2015 and 2016, but increased between 2016 and 2017.

5.2.2 Competition for Prey

Competition could exist between Steller sea lions and commercial fishing for prey species. NMFS (2008) noted there are commercial fisheries that target key Steller sea lion prey, including Pacific cod, salmon, and herring in the eastern portion of their range. It was recognized that in some regions fishery management measures appear to have reduced this potential competition (e.g., no trawl zones and gear restrictions on various fisheries in southeast Alaska) and in others the very broad distribution of prey and seasonal fisheries that differs from that of sea lions may minimize competition as well.

5.2.3 Vessel Strikes and Disturbance

Vessel Strikes

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). Since 2000, there have been four reported ship strikes of Steller sea lions within Alaska, all in the Gulf of Alaska (Table 10).

Table 10. Confirmed vessel strikes of Steller sea lions in Alaska since 2000. Data from NMFS Alaska Region Stranding Database (2017).

Year	Month	Area	Age	Sex	Length (cm)
2015	June	SE Alaska (Sitka)	unknown	unknown	unknown
2009	Apr	SE Alaska (Sitka)	adult	M	351 cm
2007	May	GOA	adult	F	114 cm
2007	Apr	SE Alaska (Sitka)	unknown	unknown	unknown

Disturbance
As discussed above for humpback whales, the current Icy Strait Point facility has been operating as a port of call for cruise ship passengers since 2004. The facility gets about 72 vessel calls per 90-day season each year. Icy Strait Point and Point Adolphus are already heavily used tourism areas in the summer months. There is no published information on the effects of this vessel traffic to marine mammals, however NMFS expects that mild behavioral changes could be occurring when Steller sea lions encounter vessels in the water. There are no Steller sea lions rookeries or haulouts in the action area, so disturbance of hauled-out Steller sea lions does not occur.

5.2.4 Climate Change

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

The effects of climate changes to the marine ecosystems of the Gulf of Alaska, including Icy Strait, 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).

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 data available, the proposed construction activities may cause these primary stressors:

1. sound field produced by impulsive noise sources (impact hammer);
2. sound fields produced by continuous noise sources such as: vessel traffic, vibratory pile-driving and removal, and drilling (socketing and anchoring) operations;
3. risk of vessels striking marine mammals;
4. habitat changes including water quality and turbidity; and
5. pollution from unauthorized spills.

Most of the analysis and discussion of effects to western DPS Steller sea lions and Mexico DPS humpback whales from this action will focus on exposure to impulsive and continuous noise sources because NMFS assumes these stressors will have the most direct impacts.

6.1.1 Acoustic Thresholds

Since 1997, NMFS has used generic sound exposure thresholds to determine whether an activity produces underwater and in-air sounds that might result in impacts to marine mammals (70 FR 1871, 1872; January 11, 2005). NMFS recently developed comprehensive guidance on sound levels likely to cause injury to marine mammals through onset of permanent and temporary thresholds shifts (PTS and TTS; Level A harassment) (83 FR 28824; June 21, 2018). NMFS is in the process of developing guidance for behavioral disruption (Level B harassment). However, until such guidance is available, NMFS uses the following conservative thresholds of underwater sound pressure levels[2], expressed in 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 following thresholds for underwater sounds that cause injury, referred to as Level A harassment under section 3(18)(A)(i) of the MMPA (NMFS 2016c). These thresholds were developed by compiling and synthesizing the best available science, and are provided in Table 11 below. The references, analysis, and methodology used in the development of the thresholds are described in NMFS 2018 Technical Guidance, which may be accessed at https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-acoustic-technical-guidance. 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 11. 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

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

Hearing Group	PTS Onset Acoustic Thresholds* (Received Level)	
	Impulsive	Non-impulsive
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 1µPa^{2}s. In this Table, thresholds are abbreviated to reflect American National Standards Institute standards (ANSI 2013). However, peak sound pressure is defined by ANSI as incorporating frequency weighting, which is not the intent for this Technical Guidance. Hence, the subscript "flat" is being included to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range. The subscript associated with cumulative sound exposure level thresholds indicates the designated marine mammal auditory weighting function (LF, MF, and HF cetaceans, and PW and OW pinnipeds) and that the recommended accumulation period is 24 hours. The cumulative sound exposure level thresholds could be exceeded in a multitude of ways (i.e., varying exposure levels and durations, duty cycle). When possible, it is valuable for action proponents to indicate the conditions under which these acoustic thresholds will be exceeded.

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

- 100 dB re 20µPa$_{rms}$ 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] (16 U.S.C. § 1362(18)(A)).

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).

As described below, we anticipate that exposures to listed marine mammals from noise associated with the proposed action may result in disturbance and potential injury.

6.1.2 Stressors Not Likely to Adversely Affect ESA-listed Species

Based on a review of available information, we determined which of the possible stressors may affect, but are not likely to adversely affect listed species. These include habitat changes including water quality and turbidity, pollution from unauthorized spills, and in-air noise. We briefly analyze them below. As noted earlier, the project includes the installation of 16-in steel piles on land; because these piles will be installed on land, installation is not expected to affect

ESA-listed species and is not discussed in the Effects section.

6.1.3 Changes to Habitat

Because of the relatively silt-free nature of sediments in subtidal areas, relatively little material will be suspended in the water column during pile driving. However, turbidity may be increased above background levels within the immediate vicinity of construction activities and could exceed turbidity criteria for state water quality standards (18 AAC 70). Because of local currents and tidal action, any potential water quality exceedances are expected to be temporary and highly localized. The local currents will disperse suspended sediments from pile-driving operations at a moderate to rapid rate depending on tidal stage. Fish and marine mammals in the Icy Strait region are routinely exposed to substantial levels of suspended sediment from glacial sources.
Steel piles used during construction will not introduce or leach contaminants into the sediment, and resuspension will be temporary, highly localized, and minor. Pile removal will be conducted with a vibratory hammer, creating minimal resuspension.

Short-term effects on listed marine mammal species may occur if petroleum or other contaminants accidentally spill into Icy Strait from machinery or vessels during construction activities. Assuming normal construction and vessel activities, discharges of petroleum hydrocarbons are expected to be small and are not expected to result in high concentrations of contamination within the surface waters. Mitigation measures (described in Section 2) will be implemented to minimize the risk of fuel spills and other potential sources of contamination. Spill prevention and spill response procedures will be maintained throughout construction activities. Therefore, short-term adverse effects on Steller sea lions and humpback whales will be insignificant. No long-term effects on water quality are expected to occur in the action area as the result of the proposed action.
Construction activities, in the form of increased turbidity, have the potential to adversely affect forage fish and juvenile salmonid migratory routes in the project area. Both herring and salmon form a significant prey base for Steller sea lions, and herring is a primary prey of humpback whales. Increased turbidity is expected to occur in the immediate vicinity of construction activities. However, suspended sediments and particulates are expected to dissipate quickly within a single tidal cycle.

Juvenile salmon (which are prey for Steller sea lions and humpback whales) have been shown to avoid areas of unacceptably high turbidities (e.g., Servizi 1988), although they may seek out areas of moderate turbidity (10 to 80 nephelometric turbidity units [NTU]), presumably as cover against predation (Cyrus and Blaber 1987a and 1987b). Feeding efficiency of juveniles is also impaired by turbidities in excess of 70 NTU, well below sublethal stress levels (Bisson and Bilby 1982). Reduced preference by adult salmon homing to spawning areas has been demonstrated where turbidities exceed 30 NTU (20 milligrams per liter [mg/L] suspended sediments). However, Chinook salmon exposed to 650 mg/L of suspended volcanic ash were still able to find their natal water (Whitman *et al.* 1982). Based on these data, it is unlikely that the locally elevated turbidities generated by the proposed action would directly affect juvenile or adult salmonids that may be present during pile driving activities.

Similarly, in a feeding study with Pacific herring larvae, fish were exposed to suspensions of estuarine sediment and Mount Saint Helens volcanic ash at concentrations ranging from zero to 8,000 mg/L. In all experiments, maximum feeding incidence and intensity occurred at levels of suspension of either 500 or 1,000 mg/L, with values significantly greater than controls (0 mg/L). Feeding decreased at greater concentrations. The suspensions may have enhanced feeding by providing visual contrast of prey items on the small perceptive scale used by the larvae. Larval residence in turbid environments such as estuaries may also serve to reduce predation from larger, visual planktivores, while searching ability in the small larval perceptive field is not decreased (Boehlert and Morgan 1985).

Based on these studies and the mitigation, it is unlikely that the short-term (212 hours over 75 days) and localized increase in turbidities generated by the proposed actions would measurably affect juvenile or adult salmonids and herring that may be present in the action area. Therefore, the potential indirect effects on the prey species of Steller sea lions and humpback whales will be insignificant.

Furthermore, foraging Steller sea lions and humpback whales within the action area would not be measurably impacted by elevated turbidities, given the highly localized and temporary nature of any project effects. Therefore, the potential effects on Steller sea lions and humpback whales will be insignificant.

Hollow steel piles will be used for construction of the terminal and will not introduce or leach contaminants into the sediment surrounding the project site. Existing sediment quality in the project area is assumed to be good and relatively free of contaminants, so there will not be any resuspension of contaminants due to pile driving activities. Therefore, no direct effects on habitat and biota associated with Steller sea lions or humpback whales are anticipated from pile driving and other construction activities.

Proposed construction will alter existing nearshore habitats by increasing overwater coverage. This increase in overwater shading may affect the migration and rearing of juvenile salmon, the adults of which are prey of Steller sea lions. The scientific literature reflects that juvenile salmon migrating along shorelines have consistently shown behavioral responses upon encountering overwater structures. These responses include pausing, school dispersal, and migration directional changes. The significance of these behavioral effects include displacement from optimal habitats or potential increases in predation as fish disperse away from the nearshore. Most of the literature indicates that the change in light intensity between open areas and shading provided by the overwater structure is a primary contributor of behavioral effects. However, there is little empirical evidence to indicate that these behavioral responses result in decreases in fitness or population (Nightingale and Simenstad 2001).

Several salmon-bearing streams and rearing areas are present near the project site, as discussed in the *Marine Mammal Occurrence and Exposure Estimation* section, so it is quite likely that juvenile salmon rear and migrate in the vicinity of the site and would be potentially affected by proposed increases in overwater coverage.

The addition of these piles will eliminate a small amount of benthic habitats which juvenile salmon use for feeding and rearing in the nearshore. However, piles will provide a substantially greater area for epibenthic and macrovegetation attachment within the water column on the piles. Total secondary production could actually increase in the area, but it is not clear how much of

this increase would be used by juvenile salmon.
NMFS predicts that it is unlikely that the proposed increase in overwater coverage will have substantial effects on the fitness of outmigrating and rearing juvenile salmon in the project area nearshore. Similarly, the reduction of total benthic habitat with the addition of new piles is relatively small as compared with available marine habitat in Port Frederick Inlet and Icy Strait. Therefore, the effects on the prey species of Steller sea lions and humpback whales will be insignificant.

6.1.4 In-Air Noise

While Steller sea lions may be exposed to in-air noise from the pile driving and drilling activities when their heads are above water, a standard sound attenuation model suggests that sound generated from impact pile driving would attenuate to the 100db rms criterion within 167 feet from the pile, and noise from vibratory driving would fall below 100 db rms. There are no surveyed haulouts within the action area. Mitigation measures include shut-down zones that would make in-air exposure extremely unlikely to occur, so that any effects are discountable.

6.1.5 Pollution from Unauthorized Oil Spills

The project mitigation includes best management practices to prevent unintentional oils spills. While a spill is still possible, NMFS expects that with these practices in place, the likelihood of an oil spill is extremely small and thus the effects are discountable.

6.1.6 Summary of Effects

NMFS consider all stressors and effects (listed below) in this opinion in order to analyze how the action affects ESA-listed species and designated critical habitat.

Stressors Not Likely to Adversely Affect ESA-listed Species

NMFS determined that changes to habitat due to the activities associated with this project may occur, but the associated effects are expected to be too small to detect or measure and therefore insignificant to WDPS Steller sea lions and Mexico DPS humpback whales. In-air noise disturbance of Steller sea lions is likely mitigated by shut-down zones, and is discountable. Effects from spills are extremely unlikely and thus discountable.

Stressors Likely to Adversely Affect ESA-listed Species

NMFS anticipates that increased exposure to sound levels above ambient noise and increased disturbance and risk of vessel strike associated with construction are likely to adversely affect Steller sea lions and humpback whales. These two stressors are discussed further in the Exposure Analysis.

Cumulative Effects

After construction is complete, the new cruise ship dock will result in an increase in the number of cruise ships that transit to and from the area, and the construction of the new lightering float will increase the number of small vessels providing whale watching and other vessel-based tourism opportunities in the area. Vessel interactions, including collisions and disturbance from increased vessel traffic, could increase. These effects are considered in this opinion and are addressed in the Cumulative Effects Section (Section 7).

6.2 Exposure Analysis

As discussed in the *Approach to the Assessment* section of this opinion, exposure analyses are designed to identify the listed resources that are likely to co-occur with these effects in space and time and the nature of that co-occurrence. In this step of our analysis, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to an action's effects and the populations or subpopulations those individuals represent.

As discussed in Section 2.1.2 above, PR1 proposed mitigation measures that should avoid or minimize exposure of humpback whales and Steller sea lions to stressors.

6.2.1 Exposure to Noise from Pile Driving and Drilling

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

Temporarily elevated underwater noise during vibratory and impact pile driving and drilling (including socketing and anchoring) has the potential to result in Level B (behavioral) harassment of marine mammals. Extremely limited Level A harassment (resulting in injury) could occur as a result of the proposed action, resulting in the potential exposure of western DPS Steller sea lions only if they 'pop up' in the shut down zone before observers can start the shut down sequence. No Level A harassment is permitted or authorized in this opinion. The marine mammal monitoring plan will reduce the potential for exposure to levels of underwater noise above the injury threshold established by NMFS by incorporating shut-down zones and observers.

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

For this acoustic analysis we estimated exposure by considering: 1) acoustic thresholds above which the best available scientific information indicates marine mammals will be behaviorally harassed or incur some degree of permanent hearing impairment; 2) the size of the action area (the area of water that will be ensonified above acoustic thresholds in a day); 3) the density or occurrence of marine mammals in ensonified area; and 4) the number of days of pile driving and removal activity.

Calculated Distances to Level A and Level B Thresholds

For this project, distances to the Level A and Level B thresholds were calculated based on various source levels, expressed in sound pressure level (SPL)[4] or sound exposure level (SEL)[5] for a given activity and pile type (e.g., vibratory removal of 30-inch-diameter steel pile, impact pile driving 42-inch-diameter steel pile) (Table 12) and, for Level A harassment, accounted for the maximum duration of that activity per day using the practical spreading model in the spreadsheet tool developed by NMFS.

6.2.3 Sound Source Levels

The intensity of pile driving sounds is greatly influenced by factors such as the type of piles, hammers, and the physical environment in which the activity takes place. There are source level measurements available for certain pile types and sizes from the similar environments recorded from underwater pile driving projects in Alaska (*e.g.*, JASCO Reports - Denes *et al*., 2017 and Austin *et al*., 2016).) that were evaluated and used as proxy sound source levels to determine reasonable sound source levels likely result from DPD's pile driving and removal activities (Table 4). Many source levels used are more conservative because the values were from larger pile sizes.

Table 12. Assumed Sound Source Levels

Activity	Sound Source Level at 10 meters	Sound Source
Vibratory Pile Driving/Removal		
24-inch steel pile permanent	161.9 SPL	The 24-inch-diameter source level for vibratory driving are proxy from median measured source levels from pile driving of 30-inch-diameter piles to construct the Ketchikan Ferry Terminal (Denes *et al*. 2016, Table 72).
30-inch steel pile temporary installation	161.9 SPL	
30-inch steel pile removal	161.9 SPL	

[4] A sound pressure level (SPL) in dB is described as the ratio between a measured pressure and a reference pressure (for underwater sound, this is 1 microPascal (μPa)), and is a logarithmic unit that accounts for large variations in amplitude; therefore, a relatively small change in dB corresponds to large changes in sound pressure. The source level (SL) represents the SPL referenced at a distance of 1 m from the source (referenced to 1 μPa), while the received level is the SPL at the listener's position (referenced to 1 μPa).

[5] Sound exposure level (SEL; represented as dB re 1 μPa^2-s) represents the total energy in a stated frequency band over a stated time interval or event, and considers both intensity and duration of exposure. The per-pulse SEL is calculated over the time window containing the entire pulse (*i.e.*, 100 percent of the acoustic energy). SEL is a cumulative metric; it can be accumulated over a single pulse, or calculated over periods containing multiple pulses. Cumulative SEL represents the total energy accumulated by a receiver over a defined time window or during an event. Peak sound pressure (also referred to as zero-to-peak sound pressure or 0-pk) is the maximum instantaneous sound pressure measurable in the water at a specified distance from the source, and is represented in the same units as the rms sound pressure.

Activity	Sound Source Level at 10 meters	Sound Source
30-inch steel pile permanent installation	161.9 SPL	
36-inch steel pile permanent	168.2 SPL	The 36-inch and 42-inch pile source level is a proxy from median measured source level from vibratory hammering of 48-inch piles for the Port of Anchorage test pile project (Austin *et al*., 2016).
42-inch steel pile permanent	168.2 SPL	
Impact Pile Driving		
36-inch steel pile permanent	186.7 SEL/ 198.6 SPL	The 36-inch and 42-inch diameter pile source level is a proxy from median measured source level from impact hammering of 48-inch piles for the Port of Anchorage test pile project (Austin *et al*., 2016).
42-inch steel pile permanent	186.7 SEL/ 198.6 SPL	
Socketed Pile Installation		
24-inch steel pile permanent	166.2 SPL	The socketing and rock anchor source level is a proxy from median measured source level from down-hole drilling of 24-inch-diameter piles to construct the Kodiak Ferry Terminal (Denes *et al*., 2016, Table 72).
30-inch steel pile temporary	166.2 SPL	
Rock Anchor Installation		
8-inch anchor permanent (for 24-inch piles)	166.2 SPL	The socketing and rock anchor source level is a proxy from median measured source level from down-hole drilling of 24-inch-diameter piles to construct the Kodiak Ferry Terminal (Denes *et al*., 2016, Table 72).
33-inch anchor permanent (for 36-inch piles)	166.2 SPL	
33-inch anchor permanent (for 42-inch piles)	166.2 SPL	

Notes: Denes *et al*., 2016 - *Alaska Department of Transportation's Hydroacoustic Pile Driving Noise Study - Comprehensive Report* and Austin *et al.*, 2016 - *Hydroacoustic Monitoring Report: Anchorage Port Modernization Project Test Pile Program. Version 3.0. Technical report by JASCO Applied Sciences for Kiewit Infrastructure West Co.*

6.2.4 Level A Harassment

Sound Propagation

NMFS used the NMFS User Spreadsheet (a prediction model) to predict the closest distance from stationary acoustic sources (like impact and vibratory pile driving) at which, if a Steller sea lion or humpback whale remained at that distance the whole duration of the activity, it would incur PTS. Inputs to and outputs from the model are described in the next 3 tables.

Table 13. NMFS Technical Guidance (2018) User Spreadsheet Input to Calculate PTS Isopleths for Vibratory Pile Driving.

USER SPREADSHEET INPUT –Vibratory Pile Driving/Anchoring and Socketing Spreadsheet Tab A.1 Vibratory Pile Driving Used.									
	24-in piles (permanent)	**30-in piles (temporary install)**	**30-in piles (temporary removal)**	**30-in piles (permanent)**	**36-in piles (permanent)**	**42-in piles (permanent)**	**8-in anchoring**	**33-in anchoring**	**24-in and 30-in socketing**
Source Level (RMS SPL)	161.9	161.9	161.9	161.9	168.2	168.2	166.2	166.2	166.2
Weighting Factor Adjustment (kHz)	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Number of piles within 24-hr period	4	6	6	2	2	2	1	2	2
Duration to drive a single pile (min)	10	20	10	30	30	60	60	240	60
Propagation (xLogR)	15	15	15	15	15	15	15	15	15
Distance of source level measurement (meters)+	10	10	10	10	10	10	10	10	10

Table 14. NMFS Technical Guidance (2018) User Spreadsheet Input to Calculate PTS Isopleths for Impact Pile Driving.

USER SPREADSHEET INPUT – Impact Pile Driving Spreadsheet Tab E.1 Impact Pile Driving Used.		
	36-in piles (permanent)	**42-in piles (permanent)**
Source Level (Single Strike/shot SEL)	186.7	186.7
Weighting Factor Adjustment (kHz)	2	2
Number of strikes per pile	100	135
Number of piles per day	4	2
Propagation (xLogR)	15	15
Distance of source level measurement (meters)+	10	10

Calculated Isopleths and Shut-down Zones

Table 15 shows the calculated isopleths for Level A harassment to Steller sea lions and humpback whales from the sources and project components detailed above.

DPD will use shut-down zones (Table 16) to avoid Level A harassment of humpback whales and Steller sea lions. For all of the vibratory pile driving and removal, socketed pile, and rock anchor installation scenarios, the shut-down zone has been rounded up from the calculated isopleth to 10 meters (for Steller sea lions) or 25 meters (for humpback whales) to create a more efficient and effective protocol for observers, and to ensure that animals are seen before they enter the Level

A zone. There are two exceptions. The calculated isopleth for 42-inch vibratory pile-driving for humpback whales was 32.7 meters, and for 33-in rock anchor installation of 36 and 42-inch piles was 60.7. Because these calculations exceeded 25 meters, these shut-down zones were rounded up to 50 meters for vibratory pile driving and 100 meters for rock anchor installation.

For impact pile driving, the distances calculated to Level A harassment thresholds for 36-inch piles assumed 100 strikes per pile and a maximum of 4 piles installed in 24 hours; for 42-inch piles NMFS assumed 135 strikes per pile and a maximum of 2 piles installed in 24 hours. This resulted in a shorter isopleth for 42-inch impact pile driving (736.2 m for humpbacks and 28.7 m for Steller sea lions) than 36-inch impact pile driving (956.7m for humpbacks and 37.3 m for Steller sea lions). Shutdown zones (Table 16) are rounded up to create a more efficient and effective protocol for observers, and to ensure that animals are seen before they enter the shut-down zone.

Table 15. NMFS Technical Guidance (2018) User Spreadsheet Outputs to Calculate Level A Harassment PTS Isopleths.

USER SPREADSHEET OUTPUT		PTS isopleths	
		Level A harassment	
Activity	**Sound Source Level at 10 m**	**Low-Frequency Cetaceans**	**Otariid**
Vibratory Pile Driving/Removal			
24-in steel installation	161.9 SPL[1]	6.0	0.3
30-in steel temporary installation	161.9 SPL[1]	12.4	0.5
30-in steel removal	161.9 SPL[1]	7.8	0.3
30-in steel permanent installation	161.9 SPL[1]	7.8	0.3
36-in steel permanent installation	168.2 SPL[2]	20.6	0.9
42-in steel permanent installation	168.2 SPL[2]	32.7	1.4
Impact Pile Driving			
36-in steel permanent installation	186.7 SEL/ 198.6 SPL[2]	956.7	37.3
42-in steel permanent installation	186.7 SEL/ 198.6 SPL[2]	736.2	28.7
Socketed Pile Installation			
24-in steel permanent installation	166.2 SPL[3]	24.1	1.0
30-in steel temporary installation	166.2 SPL[3]	24.1	1.0
Rock Anchor Installation			

USER SPREADSHEET OUTPUT		PTS isopleths	
		Level A harassment	
Activity	Sound Source Level at 10 m	Low-Frequency Cetaceans	Otariid
8-in anchor permanent installation (for 24-in piles	166.2 SPL[3]	15.2	0.6
33-in anchor permanent installation (for 36-in piles)	166.2 SPL[3]	60.7	2.6
33-in anchor permanent installation (for 42-in piles)	166.2 SPL[3]	60.7	2.6

[1] The 24-in and 30-in-diameter source levels for vibratory driving are proxy from median measured source levels from pile driving of 30-inch-diameter piles to construct the Ketchikan Ferry Terminal (Denes *et al*. 2016, Table 72).
[2] The 36-in and 42-in-diameter pile source levels are proxy from median measured source levels from pile driving (vibratory and impact hammering) of 48-inch piles for the Port of Anchorage test pile project (Austin et al. 2016, Tables 9 and 16). We calculated the distances to impact pile driving Level A harassment thresholds for 36-inch piles assuming 100 strikes per pile and a maximum of 4 piles installed in 24 hours; for 42-inch piles we assumed 135 strikes per pile and a maximum of 2 piles installed in 24 hours.
[3] The socketing and rock anchoring source level is proxy from median measured sources levels from down-hole drilling of 24-inch-diameter piles to construct the Kodiak Ferry Terminal (Denes *et al*. 2016, Table 72).

Table 16. Shutdown Zones during Project Activities to avoid Level A take.

Sound Source	Shutdown Zones (radial distance in meters, area in km^2)	
	Humpback Whales	Steller Sea Lions
In-Water Construction Activities		
Barge movements, pile positioning, sound attenuation placement*	10 m (0.00093 km^2)	10 m (0.00093 km^2)
Vibratory Pile Driving/Removal		
24-in steel installation (18 piles; ~40 min per day on 4.5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
30-in steel temporary installation (62 piles; ~2 hours per day on 10.5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
30-in steel removal (62 piles; ~1 hour per day on 10.5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
30-in steel permanent installation at lightering float (3 piles; ~1 hour per day on 1.5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)

Sound Source	Shutdown Zones (radial distance in meters, area in km^2)	
	Humpback Whales	Steller Sea Lions
36-in steel permanent installation (16 piles; ~1 hour per day on 8 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
42-in steel permanent installation (8 piles; ~2 hours per day on 4 days)	50 m (0.02307 km^2)	10 m (0.00093 km^2)
Impact Pile Driving		
36-in steel permanent installation (16 piles; ~10 minutes per day on 4 days)	1,000 m (2.31 km^2)	50 m (0.02307 km^2)
42-in steel permanent installation (8 piles; ~6 minutes per day on 4 days)	750 m (1.44 km^2)	50 m (0.02307 km^2)
Socketed Pile Installation		
24-in steel permanent installation (18 piles; ~2 hours per day on 9 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
30-in steel temporary installation (up to 10 piles; ~2 hours per day on 5 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
Rock Anchor Installation		
8-in anchor permanent installation (for 24-inch piles, 2 anchors; ~1 hour per day on 2 days)	25 m (0.005763 km^2)	10 m (0.00093 km^2)
33-in anchor permanent installation (for 36- and 42-inch piles, 24 anchors; ~8 hours per day on 12 days)	100 m (0.0875 km^2)	10 m (0.00093 km^2)

6.2.5 Level B Harassment

Sound Propagation

We assume that sound propagation in this project can be described using practical spreading loss (4.5 dB reduction in sound level for each doubling of distance), which is common in coastal waters. Practical spreading (15 Log R) is often used where water depth increases as the receiver moves away from the shoreline, between spherical (6 dB) and cylindrical (3 dB) spreading loss conditions.

Calculated Isopleths and Monitoring Zones
Utilizing the practical spreading loss model, DPD determined underwater noise will fall below the behavioral effects threshold of 120 dB rms for Steller sea lions and humpback whales at the distances shown in Table 17 for vibratory pile driving/removal, socketing, and rock anchoring. For calculating the Level B Harassment Zone for impact driving, the practical spreading loss model was used with a behavioral threshold of 160 dB rms.

The calculated distances were rounded up to the nearest 5 meters to establish monitoring zones for the PSOs. Also, these radial distances are shortened in some instances due to the occurrence of landforms (Figure 5).

Table 17. Level B Monitoring Zones calculated using the Practical Spreading Model.

Source	Monitoring Zones (meters)*
Vibratory Pile Driving/Removal	
24-inch steel installation (18 piles; ~40 min per day on 4.5 days)	6,215
30-inch steel temporary installation (72 piles; ~2 hours per day on 12 days)	6,215
30-inch steel removal (72 piles; ~1 hour per day on 12 days)	6,215
30-inch steel permanent installation (3 piles; ~1 hour per day on 1.5 days)	6,215
36-inch steel permanent installation (20 piles; ~1 hour per day on 10 days)	16,345
42-inch steel permanent installation (10 piles; ~2 hours per day on 5 days)	16,345
Impact Pile Driving	
36-inch steel permanent installation (20 piles; ~10 minutes per day on 5 days)	3,745
42-inch steel permanent installation (10 piles; ~6 minutes per day on 5 days)	3,745
Socketed Pile Installation	
24-inch steel permanent installation (18 piles; ~2 hours per day on 9 days)	12,025
30-inch steel temporary installation (up to 10 piles; ~2 hours per day on 5 days)	12,025
Rock Anchor Installation	
8-inch anchor permanent installation (for 24-inch piles, 2 anchors; ~1 hour per day on 2 days)	12,025
33-inch anchor permanent installation (for 36 -inch piles, 30 anchors; ~8 hours per day on 15 days)	12,025
33-inch anchor permanent installation (for 42-inch piles, 30 anchors; ~8 hours per day on 15 days)	12,025

*Numbers have been rounded up to nearest 5 meters.

6.2.6 Marine Mammal Occurrence and Exposure Estimation

There are no available density estimates of Steller sea lions or humpback whales in the action area. NMFS used the following data sources in order to estimate presence of animals in the action area:

- Icy Strait observations from 2015 (BergerABAM. 2016. Marine Mammal Monitoring Summary Report: Icy Strait Cruise Ship Terminal. 27 p.)
- Glacier Bay/Icy Strait NPS Survey data 2014-2018 (dataset provided by NPS, March 2019)
- Whale Alert opportunistic reported sightings 2016-2018 (extracted March 2019)
- Reported humpback whale bubble-net feeding group to NPS, 2015-2018 (provided by NPS, March 2019)

Marine mammal species can occur year-round in the action area; however, Steller sea lion and humpback whale use of habitat in and around the action area varies substantially by season. NMFS grouped data from the sources listed above by month to reflect this seasonality of usage (described for each species in the next section). The applicant estimated the project could include up to 4.5 months of work on ~75 working days starting June 1 and continuing into November as needed. NMFS conservatively estimated 17 days per month for June, July, August, and September, then 7 days in October, and 3 days in November (totaling 78 days).

Estimating the exposures of humpback whales

As described in the Status of the Species section, humpback whales feed in southeast Alaska into the late Fall, and then most begin their migration back to Mexico or Hawaii. Humpback whale presence in and near the action area is likely to be consistent through the beginning of the project work period until they begin their late Fall migration. NMFS has received reports of humpback whales over-wintering in Southeast Alaska, but numbers of animals and exact locations are very hard to predict, and NMFS assumes the presence of much fewer humpbacks in the action area in November and later winter months.

BergerABAM (2016) on-site monitoring during 2015 construction of the first cruise ship dock at Icy Strait Point reports that humpback whales were observed in relatively consistent numbers throughout the monitoring period, and were distributed fairly uniformly throughout the waters of Port Frederick and Icy Strait. In total, humpback whales were observed on 84 of the 135 days of marine mammal monitoring. Humpback whales were most often seen as lone individuals, but groups of two or more individuals were common as well, with a maximum observed group size of 18. The most frequently observed behaviors were swimming at the surface in transit, circling/milling, and sounding dives. Humpback whales were occasionally observed breaching.

The National Park Service Glacier Bay/Icy Strait survey is designed to observe humpback whales and has regular effort in June, July, and August. That was the primary data source used to estimate exposures of humpback whales in the action area during those months, except for when a maximum group size reported in Whale Alert data was greater, then the Whale Alert number was used (for example the June and July maximum group size). The on-site marine mammal monitoring data during construction of the first cruise ship dock at Icy Strait (BergerABAM 2016) was used to estimate takes in September and October. Whale Alert data was the only data source available in November and could represent a minimum number of observations due to fewer opportunistic sightings recorded in that month.

In addition, NMFS added a single group of bubble-net feeding humpbacks of 10 animals to the total estimated exposures for June and October, based on anecdotal data provided by NPS of bubble-net feeding groups of humpbacks observed in the action area in those months (NPS, 2019).

To estimate the number of animals present in the action area, NMFS chose the average number of daily sightings for a given month (reported previously in the datasets described above) on most work days that month. In order to account for the occasional presence of larger group sizes (BergerABAM, 2016), NMFS chose the maximum number of daily sightings for a given month on some of the work days in that month. NMFS calculated the proportion of days of the month when the numbers of animals observed were within one standard deviation of that month's average daily sightings. That proportion was 0.7. NMFS estimated that the average number of sighted whales would be exposed to acoustic noise on 70% of the days of construction in that month. For the remaining 30% of work days in that month, NMFS estimated that the maximum number of observations on any single day of that month historically would be exposed on that number of days. In addition, historical data of bubble-net feeding in the action area in June and October was used to increase those monthly estimates (data provided by NPS March 2019 for bubble-net feeding are a separate data source and were not included in the maximum number of daily sightings.)

For example, in June, the average number of daily observations (1.31) was estimated to occur on 70% of the 17 work days (11.9 days), which resulted in 15.59 exposures.[6] On the other 30% of the 17 work days (5.1 days), the maximum number of observations on any day (aside from bubble-net feeding) (10) resulted in 51 estimated exposures.[7] And, in June, NMFS estimates that one bubble-net feeding group of 10 individuals could be exposed on a single one of any of the work days, due to anecdotal evidence of this feeding activity occurring inside the proposed action area (NPS data March 2019). NMFS estimates a total of 76.59 humpback whales (15.59 + 51 + 10) could be exposed in June (Table 18). Humpback whales could be in larger groups when large amounts of prey are available, but this is difficult to predict with any precision.

Table 18. Estimated Level B Exposures of Humpback Whales by month.

Month	# days working	Average[5] #	Max[5] #	Bubble net #	Total
June	17	1.31[1]	10[3]	10[4]	76.59
July	17	1.43[1]	10[3]		68.017
August	17	1.33[1]	11[1]		72.927
September	17	4.67[2]	15[2]		132.073
October	7	6.33[2]	18[2]	10[4]	78.817

[6] 1.31 average animals observed per day x 11.9days = 15.589 exposures to humpback whales in June for 70% of activity days (REFERNCE).
[7] 10 max animals per day x 5.1days = 51 exposure of humpback whales in June for 30% of activity days (REFERNCE).

Month	# days working	Average[5] #	Max[5] #	Bubble net #	Total
November	3	1.67[3]	3[3]		6.207
Total	78				433.63

Feeding Season months are in bold typeface in this table.
Months when most whales are migrating to Mexico or Hawaii are in italics in this table
[1]Glacier Bay/Icy Strait survey data
[2]Icy Strait 2015 monitoring data
[3]Whale Alert data
[4]Anecodotal records of bubble-net feeding (NPS, March 2019)
[5]When multiple sources of data were available, preference was given to the on-site observations from 2015 monitoring, however, when newer data reporting larger numbers was available via Whale Alert or the Icy Strait portion of the NPS survey, that data was used.

NMFS assumes that the proportion of humpback whales from the Mexico DPS occurring in the action area is 0.0601 based on Wade et al (2016).

Table 19. Estimated Level B Exposures of Humpback Whales

Season	Total Exposures	Proportion of Animals likely Mexico DPS*	Number of Mexico DPS animals
Feeding (start of project through October)	427.423	.0601	25.688
Migration to Mexico or Hawaii (November)	6.207	.0601	0.373
Total	433.63		26.061

*Wade et al, 2016
Feeding Season months are in bold typeface in this table.
Months when most whales are migrating to Mexico or Hawaii are in italics in this table

Estimating the exposures of Steller sea lions

Womble *et. al.* (2005, 2009) and Straley et al. (2017) have studied the seasonal ecology of Steller sea lions in Southeast Alaska by relating the distribution of sea lions to prey availability. Figure 11 depicts a likely seasonal foraging strategy for Steller sea lions in Southeast Alaska. Their 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. Concentrated numbers of Steller sea lions in the action area are most likely to occur during seasonal prey aggregation. Herring, walleye pollock, salmon, and eulachon are among the species that congregate ephemerally. Similarly, the NMFS 2014 Status Review of Southeast Alaska Pacific Herring generalizes that sea lions forage on herring aggregations in winter, on spawning herring and eulachon in spring, and on various other species throughout the year. Kruse (2000) report that herring fishery managers use the presence of Steller sea lions on the spring spawning grounds as an indicator that spawning is imminent, even though herring have been in deeper adjacent waters for weeks prior to arrival of Steller sea lions.

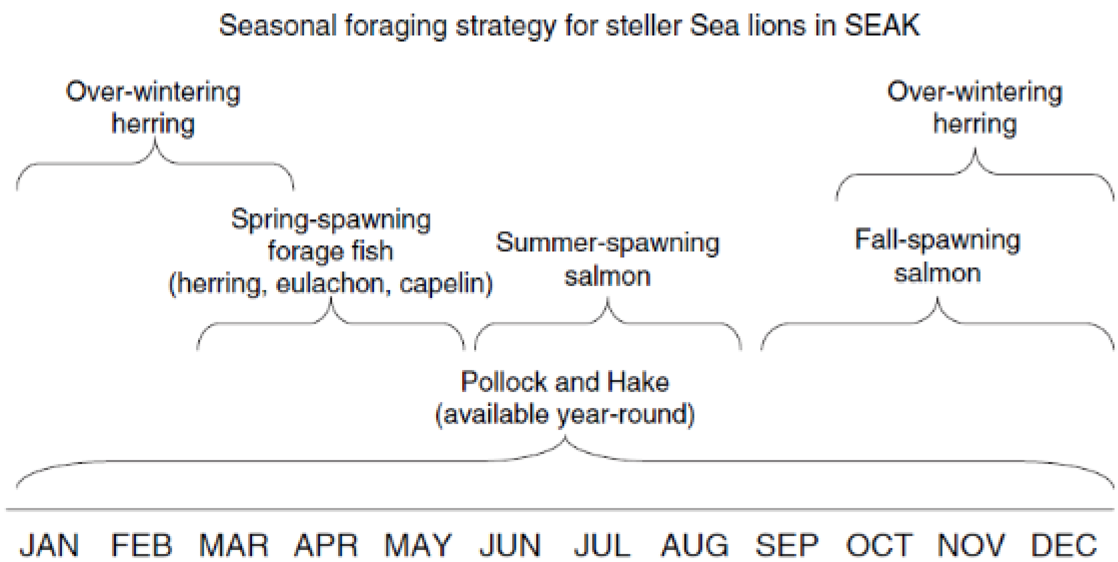

Figure 11. Seasonal foraging ecology of SSL. Reproduced with permission from Womble et. al., 2009.

There are several anadromous waters inside and very near the action area as coded in the Alaska Department of Fish and Game's anadromous waters catalog, accessed online at www.adfg.alaska.gov in June 2016. These streams are shown in pink in Figure 10. Eulachon and herring spawning occur in Port Frederick in April or May (NMFS 2006).

The action area and surrounding waters contain abundant sources of prey species available to Steller sea lions year-round, but NMFS expects that Steller sea lion presence in the action area will vary due the spatial distribution of breeding versus non-breeding season. In April and May (before this project begins), Steller sea lions are likely feeding on herring spawn in the action area. However, before the project start date in June, it is likely that most Stellers have moved to the rookeries along the outside coast of Chichagof Island (away from the action area) for breeding season. They are likely to be back in the action area in greater numbers again after breeding season in August and later months for late-summer salmon runs (J. Womble, NPS, personal communication, March 2019). Sea lions are also opportunistic predators and their presence can be hard to predict.

BergerABAM (2016) on-site monitoring during 2015 construction of the first cruise ship dock at Icy Strait Point reports that Steller sea lions were observed during all months of the monitoring period, although a distinct peak in the presence of this species occurred between late August and mid-October. In total, Steller sea lions were observed on 47 of the 135 days of marine mammal monitoring. Steller sea lions were frequently observed in groups of two or more individuals, but lone individuals were also observed regularly. The most common behaviors observed were milling/circling, and swimming at surface in transit. Foraging behaviors were also observed.

NMFS's process for estimating the numbers of Steller sea lions in the action area during breeding and non-breeding seasons is similar to that described above for humpback whales. To estimate the number of animals present in the action area, NMFS chose the average number of daily sightings for a given month (reported previously in the datasets described above) on most work days that month. In order to account for the occasional presence of larger group sizes that occur in both the on-site monitoring data and the Icy Strait portion of the NPS survey data, NMFS estimated that the maximum number of daily sightings for a given month could occur on several of the work days in that month. NMFS calculated the proportion of days of the month when the numbers of animals observed were within one standard deviation of that month's average daily sightings. That proportion was 0.79. NMFS estimated that the average number of sightings would be exposed to acoustic noise on 79% of the days of construction in that month. For the remaining 21% of work days in that month, NMFS estimated that the maximum number of observations on any single day of that month historically could be exposed on that number of days.

For example, in June, the average number of daily observations (1.6) was estimated to occur on 13.43 work days, which would result in 21.48 exposures. On the other 21% of the 17 work days, the maximum number of observations on any day (26) could result in 92.82 estimated exposures. NMFS estimates a total of 114.31 Steller sea lions could be exposed in June (Table 20).

NMFS realizes that this process could create an overestimate of the number of exposures, but it is also likely that additional large groups could appear, causing an underestimate. These estimates represent the amount of exposures that are reasonably likely to occur.

Table 20. Estimated Level B Exposures of Steller sea lions by month.

Month	Number of days working	Average[3] Number of Animals	Max[3] Number of Animals	Total
June	17	1.6[1]	26[1]	114.308
July	17	1.6[1]	10[1]	57.188
August	17	1.6[1]	20[1]	92.888
September	17	6.86[2]	30[1]	199.2298
October	7	5[2]	35[1]	79.1
November	3	4.6[2]	9[2]	16.572
Total	78			559.286

Breeding Season months are in bold typeface in this table
Non-breeding Season months are in italics in this table
[1]Glacier Bay/Icy Strait survey data
[2]Icy Strait 2015 monitoring data
[3]When multiple sources of data were available, preference was given to the on-site observations from 2015 monitoring, however, when newer data reporting larger numbers was available via the Icy Strait portion of the NPS survey, that data was used.

When present in the action area, NMFS assumes that the percentage of Steller sea lions from the Western DPS is 0.0703 (Hastings, personal communication[8], May 2019).

[8] Kelly Hastings at the Alaska Department of Fish and Game has a draft manuscript that presents estimates of the proportions of Steller sea lions in small geographic areas of Southeast Alaska that are expected to be from the western DPS.

Table 21. Estimated Level B Exposures of Steller sea lions

Season	Total Exposures	% of Animals likely Western DPS*	Number of Western DPS animals
Breeding (start of project through July)	171.496	0.0703	12.056
Non-breeding (August and later)	387.789	0.0703	27.262
Total	559.286		39.318

*Hastings, DRAFT.

Table 22 below summarizes the proposed estimated take for both species described above as a percentage of stock abundance. No Level A harassment of humpback whales and Steller sea lions is permitted or authorized.

Table 22. Estimated exposures to Level A and B harassment

Species	Level A Harassment	Level B Harassment
Mexico DPS Humpback Whale	0	26 (rounded from 26.061)[9]
Western DPS Steller Sea Lion	0	39 (rounded from 39.318)[10]

6.2.7 Approach to Estimating Vessel Strike and Disturbance

Vessel strikes and disturbance could occur as both direct and indirect effects of the action. Icy Strait and Port Frederick are busy thoroughfares for commercial and recreational ship traffic, including existing cruise ship traffic to Icy Strait Point; therefore, humpback whales and Steller sea lions in this area are already exposed to ship noise and general disturbance from vessels, as well as potential strikes.

There will be a temporary and localized increase in vessel traffic during construction. A minimum number of work barges will be present at any time during the in-water and over water work. The barges will be located near each other where construction is occurring. These elements of exposure are analyzed below.

The project will also result in a sustained localized increase in seasonal cruise ship traffic and whale watch vessel activity. These effects are discussed in the cumulative effects section of this Opinion (Section 7).

[9] The proposed IHA (84 FR 18495) indicated a requested Level A take of zero humpback whales, and a Level B take of 434 humpback whale. Of the proposed takes, 6.01% are anticipated to occur to ESA-listed Mexico DPS animals.

[10] The proposed IHA (84 FR 18495) indicated a requested Level A take of 16 Steller sea lions, and a Level B take of 559 Steller sea lions. Of the proposed takes, 7.03% are anticipated to be Western DPS animals. The final IHA (in prep) will reflect a change from the initial request of 16 to zero Level A takes of Steller sea lions based on consultation with NMFS Alaska Region (May 2019).

6.2.8 Mitigation to help prevent vessel strike and disturbance

Mitigation integrated into this project will reduce the potential for vessel strike and disturbance. All vessels, before, during, and after construction, need to adhere to established NMFS regulations for approaching humpback whales (50 CFR §§ 216.18, 223.214, and 224.103(b)). Under these regulations it is unlawful for a person subject to the jurisdiction of the United States to approach, by any means, with some exceptions, within 100 yards (91.4 m) of a humpback whale.

Project vessels will also follow the NMFS Marine Mammal Code of Conduct and regulations available at http://alaskafisheries.noaa.gov/protectedresources/mmv/guide.htm

NMFS anticipates that when vessels follow these guidelines and regulations, they will be more likely to avoid disturbing marine mammals with vessel noise and more likely to avoid potential strikes.

6.2.9 Estimating the impact of vessel strike and disturbance

Although vessel strikes of Central North Pacific stock of humpback whales are documented at an annual average rate of 7 humpbacks (Allen and Angliss 2018) with most of the vessel collisions reported from Southeast Alaska, there is a low historic level of recorded strikes in the action area. NMFS expects that the risk of vessel strike will be minimized in this action due to the mitigation measures described above. Construction-related vessel interactions are not likely to occur due to the small number of vessels and their limited and slow movement in the action area, the relatively small size of the action area compared to available habitat for both species, and the limited duration of operations. Project vessels (Table 1) will be required to observe the 10 meter exclusion zone for all in-water activity, humpback whale approach regulations (50 CFR §§ 216.18, 223.214, and 224.103(b)), and the NMFS Marine Mammal Code of Conduct for vessels during transit. These mitigation measures will further reduce the likelihood of interactions.

Vessel noise associated with this action will be transmitted through water and constitutes a continuous noise source (versus an impulse noise). Marine mammal responses to vessels are generally associated with noise and depend on changes in the engine and propeller speed (Richardson 1995). Broadband source levels for small ships and supply vessels have been measured at 170 to 180 dB re: 1µPa (Richardson 1995). Based on data for vessels proposed for use during construction of the Knik Arm bridge, the loudest vessel noise associated with that project was produced by ships ranging in length from 180 to 279 feet, with source levels ranging from 170 to 180 dB re: 1 µPa. Sound from a vessel of that size would attenuate below 120 dB re: 1 µPa between 86 m and 233 m (282 and 764 feet) from the source. All of the vessels used in the proposed action (barges, and a few skiffs detailed in Table 1) will be of a similar size or smaller and therefore likely producing similar or slightly lower noise levels. The amount of noise from the barges and support vessels is expected to be insignificant.

6.2.10 Conclusions regarding Vessel Strike and Disturbance

NMFS concludes that the risk of vessel strike associated with this action to Mexico DPS humpback whales and western DPS Steller sea lions is small, especially given the mitigation measures. Also, NMFS concludes that disturbance to listed marine mammals from vessel noise is not expected to result in harassment because marine mammals in the action area are already exposed to frequent noise from vessels and thus are unlikely to alter their normal behavioral patterns in response to the incremental increase in vessel activity from this project.

6.3 Response Analysis

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

6.3.1 Responses to Noise from Pile Driving

The effects of sounds from pile driving 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 *et al.* 2004, 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) would absorb or attenuate the sound more readily than hard substrates (e.g., rock), which may reflect the acoustic wave. Soft porous substrates would also likely require less time to 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, 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 in 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 more detail the possibilities of TTS, PTS, and non-auditory physical effects.

6.3.2 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).

The received level of a single pulse likely would need to be approximately 186 dB re 1 μPa^2-s in order to produce brief, mild TTS. Exposure to several strong pulses that each have received levels near 190 dB rms might result in cumulative exposure and TTS in a small odontocete.

The above TTS information for odontocetes is derived from studies on the bottlenose dolphin (*Tursiops truncatus*) and beluga whale (*Delphinapterus leucas*). Currently, TTS data only exist for four species of cetaceans (bottlenose dolphin (Tursiops truncatus), beluga whale (Delphinapterus leucas), harbor porpoise, and Yangtze finless porpoise (Neophocoena asiaeorientalis)) and three species of pinnipeds (northern elephant seal, harbor seal, and California sea lion) exposed to a limited number of sound sources (i.e., mostly tones and octave-band noise) in laboratory settings (Finneran, 2015). TTS was not observed in trained spotted (Phoca largha) and ringed (Pusa hispida) seals exposed to impulsive noise at levels matching previous predictions of TTS onset (Reichmuth et al., 2016). In general, harbor seals and harbor porpoises have a lower TTS onset than other measured pinniped or cetacean species (Finneran, 2015). Additionally, the existing marine mammal TTS data come from a limited number of individuals within these species. There are no data available on noise-induced hearing loss for mysticetes. For summaries of data on TTS in marine mammals or for further discussion of TTS onset thresholds, please see Southall et al. (2007), Finneran and Jenkins (2012), Finneran (2015), and NMFS (2018).

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

6.3.4 Permanent Threshold Shift

When PTS occurs, there is physical damage to the sound receptors in the ear (i.e., tissue damage), whereas TTS represents primarily tissue fatigue and is reversible (Southall et al., 2007). In 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 might 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. Based on data from terrestrial mammals, a precautionary assumption is that the PTS threshold for impulse sounds (such as pile driving pulses as received close to the source) is at least 6 dB higher than the TTS threshold on a peak-pressure basis and probably greater than 6 dB (Southall *et al.* 2007). On a sound exposure level (SEL) basis, Southall *et al.* (2007) estimated that received levels would need to exceed the TTS threshold by at least 15 dB for there to be risk of PTS. Thus, for cetaceans, Southall *et al.* (2007) estimate that the PTS threshold might be an M-weighted SEL (for the sequence of received pulses) of approximately 198 dB re 1 μPa^2-s (15 dB higher than the TTS threshold for an impulse). Given the higher level of sound necessary to cause PTS as compared with TTS, it is considerably less likely that PTS could occur.

6.3.5 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.

6.3.6 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, as well as interplay between factors (Richardson *et al.* 1995, Wartzok *et al.* 2003, Southall *et al.* 2007, Weilgart, 2007; Archer et al., 2010). Behavioral reactions can vary not only among individuals but also within an individual, depending on previous experience with a sound source, context, and numerous other factors (Ellison et al., 2012), and can vary depending on characteristics associated with the sound source (e.g., whether it is moving or stationary, number of sources, distance from the source). Please see Appendices B-C of Southall et al. (2007) for a review of studies involving marine mammal behavioral responses to sound.

Habituation can occur when an animal's response to a stimulus wanes with repeated exposure, usually in the absence of unpleasant associated events (Wartzok *et al.* 2003). Animals are most likely to habituate to sounds that are predictable and unvarying. It is important to note that habituation is appropriately considered as a "progressive reduction in response to stimuli that are perceived as neither aversive nor beneficial," rather than as, more generally, moderation in response to human disturbance (Bejder et al., 2009).The opposite process is sensitization, when an unpleasant experience leads to subsequent responses, often in the form of avoidance, at a lower level of exposure. 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, Thorson and Reyff 2006, see also Gordon *et al.* 2004, Wartzok *et al.* 2003, 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 (Richardson *et al.* 1995): 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).

6.3.7 Auditory Masking

Natural and artificial sounds can disrupt behavior by masking, or interfering with, a marine mammal's ability to detect, recognize, or discriminate between acoustic signals of interest (e.g., those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation) (Richardson et al., 1995; Erbe et al., 2016). 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 which the animals utilize so the frequency range of the potentially masking sound is important in determining any potential behavioral impacts. Because sound generated from in-water vibratory pile driving is mostly concentrated at low frequency ranges, it may have less effect on high frequency echolocation sounds made by porpoises. However, 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 (e.g., Clark *et al.* 2009) and cause increased stress levels (e.g., Foote *et al.* 2004, Holt *et al.* 2009).

Masking has the potential to impact 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.

Vibratory pile driving is relatively short-term, with rapid oscillations occurring for 10 to 30 minutes per installed pile. It is possible that vibratory pile driving resulting from this proposed action may mask acoustic signals important to the behavior and survival of marine mammal species, but the short-term duration (up to 212 total hours of impact and vibratory pile driving spread over up to 75 days as presented in Table 3) 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.

6.3.8 Airborne Acoustic Effects

Marine mammals that occur in the project area could be exposed to airborne sounds associated with pile driving that have the potential to cause harassment, depending on their distance from pile driving activities. Airborne sound would only be an issue for Steller sea lions looking with heads above water in the project area, since there are no haulouts in the action area. Most likely, airborne sound would cause behavioral responses similar to those discussed above in relation to underwater sound. The NMFS threshold for Steller sea lions for in-air noise is 100 dB rms. Hart Croswer (2015) estimated that impact pile driving sounds would attenuate to below 100 dB rms within 167 feet from the sound source. Vibratory pile driving noise levels are anticipated to fall below this in-air noise criterion. This action includes shutdown zones, observation zones, and further mitigation to limit the likelihood that Steller sea lions will be exposed to in-air noise above the NMFS threshold for Level B harassment.

6.3.9 Probable Responses to Noise from Pile Driving

Pile driving activities associated with the cruise ship dock and lightering float construction, 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 while pile driving is happening.

NMFS does not anticipate any injury, serious injury, or mortality (Level A take) given the nature of the activity and measures designed to minimize the possibility of injury to Steller sea lions and humpback whales. The potential for these outcomes is minimized through the construction method and the implementation of the planned mitigation measures. Specifically, vibratory hammers will be the primary method of installation, though impact driving may be used for brief, irregular periods. Vibratory driving is not likely to cause injury to marine mammals due to the relatively low source levels produced.

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. Much of the noise generated during pile installation comes from contact between the pile being driven and the steel template used to hold the pile in place. To minimize noise during pile driving, DPD will use pile cushions made of high-density polyethylene (HDPE) or ultra-high-molecular- weight polyethylene (UHMW) softening material on all templates to eliminate steel on steel noise generation.

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 likelihood that marine mammal detection ability by trained observers is high under the required observation protocols (e.g., no construction occurring after dark or in low visibility conditions and available gear including high magnification binoculars) further enables the implementation of shutdowns to avoid injury, serious injury, or mortality.

The proposed activities are spatially and temporally localized. Actual pile driving and extraction would last approximately 212 hours over 75 days (Table 3). These localized and short-term noise exposures may cause brief startle reactions or short-term behavioral modification by the animals. These reactions and behavioral changes are expected to subside quickly when the exposures cease. Moreover, the proposed mitigation and monitoring measures are expected to reduce potential exposures and behavioral modifications even further.

In summary, up to 39 Western DPS Steller sea lions and 26 Mexico DPS humpback whales may be exposed to sound levels up to 160 dB during the proposed action. While mitigation measures including shut-down zones at 50 m for Western DPS Steller sea lions and 1,000 m for Mexico DPS humpback whales are anticipated to avoid Level A harassment, if animals approach within the zones specified in Table 5 during impact and vibratory pile removal or driving, or drilling, Level B harassment may occur.

6.3.10 Responses to Vessel Traffic and Noise

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 2004a, 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.* 1994a). These studies suggest that the behavioral responses of marine mammals to surface vessels are similar to their behavioral responses to predators.

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 2002a, Magalhaes *et al.* 2002, Ng and Leung 2003, Goodwin and Cotton 2004b, 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. *the 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).

   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);

2. *the 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 2002b);

3. *the vessel's speed and vector* (David 2002b);

4. *the 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.* 1994b, Williams *et al.* 2002, Lusseau 2006);

5. *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 2002b, Lusseau 2003, Lusseau 2006);

6. *the type of vessel* (displacement versus planing), which marine mammals may be interpret as evidence of a vessel's maneuverability (Goodwin and Cotton 2004b);

7. *the behavioral state of the marine mammals* (David 2002b, 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.* 1994b). 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.

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.

6.3.11 Probable Responses to Vessel Traffic

Vessels involved in the project are detailed in Table 1. Vessel speed, course changes, sounds associated with their engines, and displacement of water along their bowline may be considered stressors to marine mammals.

The new cruise ship dock and lightering float would create some concentration of vessel traffic in the action area during construction. There have been six recorded vessel strikes of whales in the vicinity of construction activities in the action area (Figure 10) between 1999 and 2017, but it is unknown if those animals were from the Mexico DPS. There are no Steller sea lion haulouts or rookeries within the action area, although The Sisters, Rocky Island, and Black Rock haulouts (not designated as critical habitat) are within 0.5 mile (The Sisters) to five miles (Rocky Island and Black Rock) away from the ensonified zones (Figure 10). No documented vessel strikes of Steller sea lions have occurred in the vicinity of construction activities in the action area (Figure 10).

The small number of vessels involved in the action, the 10 m exclusion zone, humpback whale approach regulations (50 CFR §§ 216.18, 223.214, and 224.103(b)), and vessels following the NMFS Marine Mammal Code of Conduct should prevent close approaches and additional harassment of Steller sea lions and humpback whales during the project. Temporary changes in behavior could occur, such as changing direction while swimming to avoid contact with vessels, detected either audibly or visually, but these responses are not expected to significantly affect individual fitness and are not likely to rise to the level of take.

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 extremely difficult 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).

Reasonably foreseeable future state, tribal, local or private actions include activities that relate to different scenarios of disturbance from vessel traffic - tourism, and transportation, commercial fishing, and community development.

7.1 Tourism

Marine and coastal vessel traffic could contribute to potential cumulative effects through the disturbance of marine mammals associated with tourism; tourism is a large industry in Southeast Alaska. McDowell Group (2014) shows the volume and trends of visitors coming to Alaska in recent years in Table 23. The summer 2017 visitor volume represent the third consecutive summer of growth. 2018 figures are not yet available.

Table 23. Trends in Summer Visitor Volume, By Transportation Market, 2008-2017. (From McDowell Group 2018)

	2008	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Cruise ship	1,033,100	1,026,600	878,000	883,000	937,000	999,600	967,500	999,600	1,025,900	1,089,700
Air	597,200	505,200	578,400	604,500	580,500	619,400	623,600	703,400	747,100	750,500
Highway/ ferry	77,100	69,900	76,000	69,300	69,100	74,800	68,500	77,000	84,500	86,100
Total	**1,707,400**	**1,601,700**	**1,532,400**	**1,556,800**	**1,586,600**	**1,693,800**	**1,659,600**	**1,780,000**	**1,857,500**	**1,926,300**

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
% change	-0.4%	-6.2%	-4.3%	+1.6%	+1.9%	+6.8%	-2.0%	+7.3%	+4.4%	+3.7%

McDowell Group (2018) also reports that Alaska's summer 2017 cruise ship visitor volume was 5% higher than a decade earlier, and up 24% from the low point of 2010.

The purpose of this project is to construct a second mooring facility and small-craft lightering float to accommodate the growth in cruise ship traffic Hoonah is currently experiencing. The project is needed because the existing berth configuration does not have the capacity to support multiple cruise ships at the same time.

Whale-watch tourism is a global industry with major economic value for many coastal communities. It has been expanding rapidly since the 1980s with an estimated 3.7% global increase in whale watchers per year between 1998-2008 (O'Connor et al., 2009). The expected increase in small vessel traffic generated by the increase in visitor numbers necessitates the addition of a small-boat lightering float for whale watches and short excursions around Icy Strait Point. Several companies operating out of Hoonah take tourists into nearby waters in Icy Strait and near Point Adolphus. Charter (sport) fishing is also popular among visitors in the area.

Given the recent trends in numbers of summer visitors reported above, NMFS anticipates that future tourism-related activities including total tourists on cruise ships and those participating in whale-watching activities are likely to increase in the action area; however, any future increases in vessel traffic are unlikely to significantly change the effects analysis over the life of the new terminal facility due to its limited capacity, its remoteness from population centers, and the short duration of the tourist season .

7.2 Transportation

Regularly-occurring vessel traffic within the action area in the summer months can be generally characterized as ferries, cruise ships, commercial fishing boats, recreational vessels, or cargo vessels. In addition, research vessels, including the NPS survey described in this opinion, also operate in and around the project area.

Nuka (2012) reports that ferries (28%), passenger vessels with overnight night accommodations (20%), and cruise ships (19%) comprise the majority of vessel activity in Southeast Alaska even though most of these vessels only operated during the five month period from May through September. Dry freight cargo barges and tank barges account for 19% and 11% of total vessel activity, respectively, while freight ships, both log and ore carriers comprise less than 3% of the total.

7.3 Community Development

Community development projects in Southeast Alaska could result in construction noise in coastal areas, and could generate additional amounts of marine traffic to support construction activities. Marine transportation could contribute to potential cumulative effects through the disturbance of marine mammals. No specific major community development projects are expected in the action area or nearby areas during the summer of 2019, however small development projects are ongoing and likely to continue.

7.4 Commercial Fishing

Salmon and halibut commercial fishing contributes to the local economy and is expected to continue into the future at a level comparable to current efforts since no drastic change to those fish stocks or fishing effort are anticipated.

7.5 Summary of Cumulative Effects

The action area will likely continue to function as a localized concentration area for fishing, tourism including whale watching, and general water-based transit. Because of the increase in future vessel traffic associated with the action, NMFS anticipates a slight increase in the risk of vessel strike following completion of this action. However, given the very low historic rate of strike in an area that is used simultaneously by humpback whales, Steller sea lions, and vessels for most of the year, NMFS expects that this increased risk will continue to be mitigated by the vessels' stewardship in following the humpback whale approach regulations (50 CFR §§ 216.18, 223.214, and 224.103(b)) and the NMFS Marine Mammal Code of Conduct.

Restrictions in capacity at the existing and new facilities and in tourism facilities in general in Southeast Alaska, as well as low expected population growth in the area, will likely limit substantial growth. These types of activities will continue to occur in the action area, but at a level comparable to present. The current and recent population trends for both Steller sea lions and humpback whales in Southeast Alaska 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 appreciable reductions in the value of designated critical habitat for the conservation of the species. These assessments are made in full consideration of the status of the species (Section 4).

As we discussed in the *Approach to the Assessment* section of this opinion, we begin our risk analyses by asking whether the probable physical, physiological, behavioral, or social responses of endangered or threatened species are likely to reduce the fitness of endangered or threatened individuals or the growth, annual survival or reproductive success, or lifetime reproductive success of those individuals.

8.1.1 WDPS Steller Sea Lion Risk Analysis

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.

Based on the results of the exposure analysis for the proposed activities, we expect a maximum of 559 total Steller sea lions may be behaviorally harassed by noise from pile driving, and that 39 of those individuals would be from the WDPS. Disturbance from vessels and potential for vessel strike may occur as a result of the proposed activities, but adverse effects to Steller sea lions from vessel disturbance are likely to be insignificant due to the following: small marginal increase in such activities relative to the environmental baseline; mitigation measures in place to reduce approach distances and transitory nature of vessels; adverse effects from vessel strike are considered discountable because sea lions are rarely struck by vessels; implementation of mitigation measures to reduce speed and approach distances; and the limited number of vessels using the action area.

Steller sea lions' probable response to pile driving and 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 animal's energy budget, time budget, or both (the two are related because foraging requires time). The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of Steller sea lions. NMFS does not anticipate any effects from this action on the reproductive success of Steller sea lions. As discussed in the Description of the Action section, this action does not overlap in space or time with Steller sea lion breeding, pupping, or nursing activities that take place on or near rookeries. There are no rookeries in the action area, and there are no construction activities occurring during the Steller sea lion breeding season. As a result, the probable responses to pile driving noise are not likely to reduce the current or expected future reproductive success of Steller sea lions 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. While a single individual may be exposed multiple times during the project, both the short duration of actual 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 Western DPS Steller sea lions in Southeast Alaska indicate that these levels, or comparable 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.

8.1.2 Mexico DPS Humpback Whale Risk Analysis

Based on the results of the exposure analysis, we expect a maximum of 434 humpback whales may be exposed to noise from pile driving, but only 26 of those humpback whales are anticipated to be from the Mexico DPS. 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 minimal 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. The risk of vessel strike is very small because of the implementation of mitigation measures to reduce speed and approach distances, and few additional vessels would be introduced during the action.

Humpback whales' probable response to pile driving, pile removal, and drilling 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 animal's energy budget, time budget, or both (the two are related because foraging requires time). The individual and cumulative energy costs of the behavioral responses we have discussed are not likely to reduce the energy budgets of humpback whales. As discussed in the Description of the Action and Status of the Species sections, this action does not overlap in space or time with humpback whale breeding. Some Mexico DPS humpback whales feed in Southeast Alaska in the summer months, and they generally migrate to Mexican waters for breeding and calving in winter months. Due to the short duration of the project, limited geographic area of the project's activities, and limited overlap with the Mexico DPS (only 6.1% of the individuals in the area are from this DPS), NMFS predicts that any changes in feeding behavior caused by stressors associated with this project will not impact the population. As a result, the probable responses to pile driving 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. While a single individual may be exposed multiple times during the project, the short duration of actual sound generation and implementation of mitigation measures to reduce exposure to high levels of sound, reduce the likelihood that exposure would cause a behavioral response that may affect vital functions, or cause TTS or PTS. Cumulative effects of future state or private activities in the action area are likely to affect humpback whales at a level comparable to present. We expect that if vessel traffic increases after completion of this project, there will be similar effects in the future to those analyzed here, and all vessels remain required, with some exceptions, to comply with the humpback whale approach regulations (50 CFR §§ 216.18, 223.214, and 224.103(b)) and the NMFS Marine Mammal Code of Conduct. Moreover, the current and recent population trends for humpback whales in Southeast Alaska indicate that these levels, or comparable levels, of activity are not hindering population growth.

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

9. CONCLUSION

After reviewing the current status of the listed species, the environmental baseline within the action area, the effects of the proposed action, and cumulative effects, it is NMFS's biological opinion that the proposed action is not likely to jeopardize the continued existence of WDPS Steller sea lions or Mexico DPS humpback whales. Additionally, 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)).

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. PR1 and the Corps of Engineers have a continuing duty to regulate the activities covered by this ITS. In order to monitor the impact of incidental take, PR1 and the Corps 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 PR1 and the Corps (1) fail to require the authorization holder to adhere to the terms and conditions of the ITS through enforceable terms that are added to the authorization, and/or (2) fail to retain oversight to ensure compliance with these terms and conditions, the protective coverage of section 7(o)(2) may lapse.

11.1 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)).

Table 24. Amount of Authorized Take.

Species	Level A Harassment	Level B Harassment
Mexico DPS Humpback Whale	0	26
Western DPS Steller Sea Lion	0	39

11.2 Effect of the Take

Available research on the effects of noise associated with pile driving and removal have suggested that Steller sea lions and humpback whales are likely to respond behaviorally upon hearing this low-frequency noise. The only takes authorized during the proposed action are takes by acoustic harassment. No injury, serious injury or mortalities of humpback whales and Steller sea lions are anticipated or authorized as part of this proposed action, and no Level A harassment or mortality is authorized. 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 marine mammals to major noise sources and any associated disruptions are not expected to affect the reproduction, survival, or recovery of these species.

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

11.3 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 western DPS 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 western DPS Steller sea lions and Mexico DPS humpback whales shall be by incidental (acoustic) harassment only. The taking by serious injury or death is prohibited and may result in the modification, suspension, or revocation of the ITS.
3. PR1 and the Corps shall require the applicant to 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. PR1 and the Corps shall provide the applicant's report to NMFS AKR that evaluates the mitigation measures and the results of the monitoring program.

11.4 Terms and Conditions

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

In order to be exempt from the prohibitions of section 9 of the ESA, PR1 and the Corps 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 of this opinion. PR1 and the Corps 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, NMFS PR1, the Corps, or their authorization holder must undertake the following:

A. NMFS PR1 and the Corps shall require their permitted operators to possess a current and valid Incidental Harassment Authorization (IHA) 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.

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

A. Conduct the action as described in this document including all mitigation measures, shut-down and observation zones unless modified by sound source verification reporting and approved modification by NMFS AKR.
B. 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.
C. 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, Kristin.Mabry@noaa.gov, the NMFS Alaska Regional Stranding Coordinator at Barbara.Mahoney@noaa.gov, and NMFS PR1 Jolie.Harrison@noaa.gov and Stephanie.Egger@noaa.gov.

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

A. The monitoring program and observation and shut down zones described in section 2.1 of the accompanying Opinion must be followed and fully observed in order to document observed incidents of harassment as described in the mitigation measures associated with this action.
B. PR1 will notify NMFS AKR with project start and end dates.

C. If the number of takes approaches 75% of the total amount authorized, PR1 should send that information in a report to Kristin.Mabry@noaa.gov, which also contains a description of the amount of project activity remaining at that point, within 5 business days.

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

A. PR1 and the Corps must adhere to all monitoring and reporting requirements as detailed in the IHA issued by NMFS under section 101(a)(5) of the MMPA.

B. DPD, through PR1 must submit a project specific report at the end of the construction (within ninety calendar days of the completion of marine mammal and acoustic monitoring or sixty days prior to the issuance of any subsequent IHA for this project, whichever comes first) that analyzes and summarizes marine mammal interactions during this project to the Protected Resources Division, NMFS by email to kristin.mabry@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 humpback whales and Steller sea lions. Note that only 6% of observed humpback whales are expected to be from the threatened Mexico DPS and will count towards the humpback whales listed in the ITS associated with this Opinion. Also, only 7% of the observed Steller sea lions are expected to be from the endangered western DPS and will count towards the Steller sea lions listed in the ITS associated with this Opinion.
- Number of power-downs and 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 with a discussion of any specific behaviors those individuals exhibited, and (B) may have been exposed to noise from pile driving, with a discussion of the nature of the probable consequences of that exposure on the individuals that were or may have been exposed.
- The report should clearly compare the number of takes (i.e. instances of exposure) authorized in the ITS with those observed during project operations.
- 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.
- Reports of any directly observed instances of humans feeding Steller sea lions or Steller sea lions scavenging on fish waste.

12. CONSERVATION RECOMMENDATIONS

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

1. In project action areas where Steller sea lions have been observed feeding on fish waste at or near fishing vessel docks, PR1 and the Corps should work with applicants, NMFS Alaska Region, and local organizations to provide training to the public on how to avoid feeding Steller sea lions, thus decreasing their attraction to the action area and minimizing harassment from the project and into the future.
2. Operators should use real-time passive acoustic monitoring to alert vessels to the presence of whales, primarily to reduce the risk of vessel strikes.
3. All vessel crews should participate in the WhaleAlert program to report real-time sightings of whales while transiting in the waters of Southeast Alaska. More information is available at https://alaskafisheries.noaa.gov/pr/whale-alert Access to view reported whale sightings to inform mitigation during construction can be arranged. Contact Kristin.Mabry@noaa.gov
4. NMFS PR1 and the Corps should work with other relevant stakeholders (the Marine Mammal Commission, International Whaling Commission, and the marine mammal research community) to develop a method for assessing the cumulative impacts of anthropogenic noise on marine mammals. This analysis includes the cumulative impacts on the distribution, abundance, and the physiological, behavioral, and social ecology of these species.

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

13. REINITIATION OF CONSULTATION

As provided in 50 CFR 402.16, reinitiation of 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.

14. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

14.1 Utility

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

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

14.2 Integrity

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

14.3 Objectivity

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

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

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

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

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